Psychobiological personality: environmental antecedents in childhood, and developmental trends and wellbeing outcomes in adulthood

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ABSTRACT

Few prospective studies have studied the development and outcomes of personality from childhood to adulthood in the light of the psychobiological theory. This study takes personality, as defined by the psychobiological theory, as the core focus and explores the predictors, development, and outcomes of adulthood personality. This study also seeks to answer an important theoretical question in personality psychology: are there observable qualitative differences between temperament and character?

The participants come from the Cardiovascular Risk in Young Finns Study (CRYF), which started in 1980. It consists of six different birth cohorts that were from three to eighteen years old in 1980. There have been eight follow-ups since then, the latest in 2012. The participants' parents answered questions about home environment in 1983. Personality was measured in 1997, 2001, and 2007, depressive symptoms in 1997, 2001, and 2007, and well-being in 2001. There were 2814, 1083, 1940, and 1911 participants in studies I-IV, respectively.

The results showed that character developed towards greater maturity in adulthood, although Self-transcendence decreased with age. Self-transcendence was the strongest predictor of overall personality change. Regarding temperament, Novelty Seeking decreased and Persistence increased slightly with age. Temperament and character traits followed different kinds of developmental trajectories. Parental care-giving and home-environment were more strongly associated with offspring character traits reflecting personality maturity (Self-directedness and Cooperativeness) than with offspring temperament traits. The differences were most evident in the cumulative effects model. Self-directedness and Cooperativeness were positively associated with well-being. Self-transcendence increased both positive and negative affect. High Harm Avoidance and low Self-directedness strongly related to depressive symptoms. In addition, sensitive (NHR) and fanatical people (ScT) were especially vulnerable to depressive symptoms.

Temperament and character had qualitative differences, which has important theoretical significance. Character was strongly influenced by childhood family environment and was strongly associated with well-being. Character development should be facilitated when trying to reduce ill-being and increase well-being.

TIIVISTELMÄ

On olemassa vain muutamia prospektiivisia tutkimuksia, jotka ovat tarkastelleet persoonallisuuden kehitystä ja seurauksia lapsesta aikuisuuteen psykobiologisen teorian näkökulmasta. Tässä tutkimuksessa tarkastellaan psykobiologisen teorian mukaista persoonallisuutta ja sen ennustajia, kehitystä ja seurauksia aikuisuudessa. Tutkimus pyrkii vastaamaan myös tärkeään persoonallisuusteoreettiseen kysymykseen: onko temperamentin ja luonteen välillä havaittavia laadullisia eroja?

Osallistuja tulevat Lasten Sepelvaltimotaudin Riskitekijät -tutkimuksesta (LASERI), joka alkoi vuonna 1980. Se koostuu kuudesta syntymäkohortista, jotka olivat vuonna 1980 3-18 -vuotiaita. LASERIssa on tehty 8 seurantatutkimusta, joista viimeisin vuonna 2012. Osallistujien vanhemmat vastasivat kysymyksiin kotiympäristöstä vuonna 1983. Persoonallisuutta mitattiin vuosina 1997, 2001 ja 2007, masennusoireita 1997, 2001 ja 2007, ja hyvinvointia 2001. Koehenkilöitä tutkimuksissa I-IV oli 2814, 1083, 1940 ja 1911.

Tulosten mukaan luonne kehittyi kohti suurempaa kypsyyttä aikuisuudessa, vaikkakin henkisyys laski iän myötä. Henkisyys oli vahvin persoonallisuuden kokonaismuutoksen ennustaja. Temperamenttipiirteistä uutuudenetsintä laski ja sinnikkyys nousi hieman iän myötä. Temperamentti ja luonne seurasivat erilaisia kehityspolkuja. Lapsuuden hoiva- ja kotiympäristö oli voimakkaammin yhteydessä kypsyyttä kuvaavin persoonallisuuspiirteisiin (itseohjautuvuus, yhteistyö) kuin temperamenttiin. Erot olivat selvimpiä kumulatiivisten vaikutusten mallissa. Itseohjautuvuus ja yhteistyö olivat positiivisesti yhteydessä hyvinvointiin. Henkisyys lisäsi sekä positiivisia että negatiivisia tunteita. Korkea haitanvälttäminen ja matala itseohjautuvuus olivat voimakkaasti yhteydessä masennusoireisiin. Sensitiiviset (NHR) ja fanaattiset ihmiset (ScT) olivat erityisen haavoittuvia masennusoireille.

Temperamentissa ja luonteessa havaittiin laadullisia eroja, millä on tärkeää teoreettista merkitystä. Luonteeseen vaikutti voimakkaasti lapsuuden perheympäristö, ja luonne oli voimakkaasti yhteydessä hyvinvointiin. Kun hyvinvointia yritetään lisätä ja henkistä pahoinvointia vähentää, luonnepiirteiden kasvua ja kehittymistä pitäisi pyrkiä tukemaan.

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ABBREVIATIONS

BDI	Beck's depression inventory
CHI	Composite Health Index
CO	Cooperativeness
HA	Harm Avoidance
HI	Happiness Index
NS	Novelty Seeking
PS	Persistence
RD	Reward Dependence
SES	Socioeconomic status
SD	Self-directedness
ST	Self-transcendence
TCI	Temperament and character inventory

1 INTRODUCTION

1.1 Personality

Personality is the core concept in this study. Personality can be defined as an individual way of thinking, feeling, and behaving (Funder, 2012). It is relatively consistent over time. Personality is of large practical and political significance since many decisions in society and human relationships are based on assumptions about human nature that personality represents (Hogan, 1998). In addition, personality is associated with happiness, distress, marital satisfaction, longevity and many other important life outcomes (Fleeson, 2004). According to Buss (1989), the effect of personality is greatest when a situation is informal and private, and when the context is familiar and not novel. Additionally, lack of detailed instructions, wide latitude of choice, and few external expectations for behavior increase the impact of personality on behavior. People can, however, maintain atypical behavior for some time due to, for example, social expectations. Eventually, a person tires of acting in accord with real or imagined expectations and reverts to his or her typical personality- related behavior (Buss, 1989).

The structure of personality can be divided into three levels (McAdams, 1995). Level 1 consists of personality traits which McAdams describes as a psychology of the stranger. Personality traits give important first-hand information about people's basic tendencies but they tell very little about motives, values, or experiences people have had. What people want and the strategies they use to get what they want form level 2 of personality. Unlike personality traits, level 2 characteristics are strongly dependent on time, place, and social roles. Level 3 consists of the life story or identity of a person. Level 3 describes a person's life over time. It tells where one came from, what one has done, where one is going, and who one is becoming. This study concentrates on personality traits, that is, the first level of personality.

There are at least three additional directions personality can be approached from (Allport, 1961). The first is universality, which means that all people resemble each other in some ways. Universality emphasizes these similarities and seeks explanations for them. The second concentrates on groups and cultures. This approach is interested in those cultural and social factors that make the in-group members similar to each other and, on the other hand, dissimilar from the out-group members. The third approach

focuses on human individuality, that is, the factors that make all people unique individuals. Some personality theories and models emphasize differences between individuals (e.g., The Five-Factor Model) and some the understanding of intra-individual processes (e.g., the psychobiological theory used in this study) (Barenbaum & Winter, 2008). The aim of the inter-individual models is to describe and capture the differences between people as accurately as possible. The intra-individual models try to capture those characteristics that make it possible to understand the behavior and personality of an individual person as accurately and comprehensively as possible.

1.1.1 The psychobiological theory of personality

The psychobiological theory of personality used in this study postulates that personality is composed of temperament and character, two interrelated moderately heritable domains which are hypothesized to interact as a non-linear dynamic system of genetic, psychological, and social variables regulating the development of human psychological functions (Cloninger, 2008). Temperament can be defined as the automatic associative responses to emotional stimuli that determine habits and moods, whereas character refers to the self-aware concepts that influence voluntary intentions, attitudes, and goals (Cloninger, Svrakic, & Przybeck, 1993). The theory posits that the most fundamental difference between temperament and character is that temperament is based on non-conscious procedural learning and perceptual memory, whereas character is based on conscious propositional learning and conceptual memory (Cloninger et al., 1993; Cloninger, 1994). Temperament defines the individual's unconscious automatic responses to different stimuli. However, these responses can be modified by character, which defines the significance and salience of different stimuli for an individual (Cloninger et al., 1993). This distinction can also be called instinct (temperament) versus will (character) (Cloninger, 1994).

The model consists of seven dimensions that describe the variation in the general population. The model aims at describing the whole range of personality from pathological to healthy (Wong & Cloninger, 2010). The model is formulated to allow differential diagnosis of personality disorder subtypes from one another and from other psychiatric disorders (Cloninger et al., 1993). Originally, the model included only the temperament dimensions, but, according to Cloninger, they did not consistently

differentiate individuals with personality disorders from well-adapted individuals (Cloninger et al., 1993). The character dimensions were added to differentiate between healthy individuals with extreme personality profiles from psychopathological extreme personality profiles. The seven personality dimensions can be measured using a self-report form called Temperament and Character Inventory (TCI).

The first temperament dimension is Novelty Seeking (NS), which is a tendency to frequent exploratory activity in pursuit of potential rewards and also active avoidance of monotony and potential punishment (Cloninger, 1987). People who scored high on the NS scale tend to be exploratory, impulsive, and irritable. People low on the NS scale are reserved, rigid, and stoical (Wong & Cloninger, 2010). The second temperament dimension is Harm Avoidance (HA), which is a tendency to respond intensively to signals of aversive stimuli and to inhibit behaviors (Cloninger, 1987). People high on the HA scale are pessimistic, fearful, shy, fatigable, and prone to anxiety. People low on the HA scale are optimistic, daring, outgoing, and energetic (Wong & Cloninger, 2010). The third temperament dimension is Reward Dependence (RD), which is a tendency to respond intensely to signals of social reward and to maintain behavior that has previously been associated with social rewards (Cloninger, 1987). People high on the RD scale are sentimental, sociable, warm, and approval-seeking. People low on the RD scale are practical, self-sufficient, and detached (Wong & Cloninger, 2010). The fourth temperament dimension is Persistence (PS), which is a tendency to perseverance despite frustration and fatigue (Cloninger et al., 1993). People high on the PS scale are industrious, determined, ambitious, and perfectionistic. People low on the PS scale are lazy, underachieving, and irresolute (Wong & Cloninger, 2010).

The first character dimension is Self-directedness (SD), which is characterized by responsibility and resourcefulness in initiating and organizing steps to achieve personal goals (Cloninger, 1994). People high on the SD scale are responsible, purposeful, and self-disciplined. People low on the SD scale are blaming, aimless, and self-defeating (Wong & Cloninger, 2010). The second character dimension is Cooperativeness (CO), which is the tendency to expresses empathy and identification with other people (Cloninger et al., 1993). People high on the CO scale are tolerant, empathic, and helpful. People with low CO are prejudiced, insensitive, and hostile (Wong & Cloninger, 2010). The third character dimension is Self-transcendence (ST), which

involves the feeling of participation in one's surrounding as a unitive whole (Cloninger, 1994). People high on the ST scale are creative, intuitive, and spiritual. People with low ST are conventional, analytical, and empirical (Wong & Cloninger, 2010).

It is important to understand that both high and low extremes of each temperament can be advantageous or disadvantageous depending on the situational context (Cloninger et al., 1993). For example, high PS helps one to perform well in work despite disappointment, frustration, and fatigue. But at the same time, the perfectionistic nature of high PS might influence negatively one's marriage by predisposing a person to neglect their family for work, or alternatively to pursue an overly perfect relationship, children, and home. So there is no one culturally preferred temperament profile. In comparison, the character dimensions correspond to key functions of mental self-government (Wong & Cloninger, 2010). Consequently, especially high SD and high CO are socially and culturally desirable because they are advantageous in most of the challenges people have to face in their lives.

1.1.2 The Five-Factor Model of personality

New information has to be linked with what is already known to form a complete and thorough synthesis of a given subject. Probably the most comprehensively studied personality taxonomy is the so-called Big Five or the Five-Factor Model. It is important to combine psychobiological theory and Five Factor Model-related research to fully understand personality as a concept and a phenomenon although the Big Five is not used in this study. According to McCrae and Costa (2008), the Five-Factor Model can be defined as an empirical generalization of the between individuals correlations of different personality traits. In itself, the model is not a personality theory. It is a way to present the associations between different personality traits in a compact and lucid form (McCrae & Costa, 2008). Different personality theories have been developed based on the model but the model itself does not explain the development or causal factors of personality. The model is based on the so-called lexical hypothesis, according to which, during the course of time, people have noticed all the relevant differences between people and invented a word for each individual difference (McCrae & John, 1992). According to the lexical hypothesis, the basic personality dimensions can be found by analyzing personality-describing words (Goldberg, 1990). This approach led to the

finding of five independent personality dimensions which are Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness.

Extraversion is strongly related to experiencing positive feelings and affect (McCrae & John, 1992). Highly extraverted people are social, talkative, and cheerful. Low Extraversion makes people quiet, reserved, and inhibited (McCrae & Costa, 2008).

Neurotic people often experience negative emotions, and they are often nervous, anxious, and self-conscious (McCrae & John, 1992). They also usually have low self-esteem. People low on Neuroticism are calm, relaxed, and balanced.

Agreeableness describes a positive attitude towards other people and towards society (McCrae & John, 1992). Highly agreeable people are altruistic, empathetic, and cooperative. Low Agreeableness is associated with hostility, self-centeredness, and enviousness (McCrae & Costa, 2008).

Conscientious people are thorough, tidy, organized, and performance-oriented. People with low Conscientiousness usually have no long-term plans, and are usually not very systematic when performing different tasks (McCrae & Costa, 2008; McCrae & John, 1992).

Open people are motivated to gain experience and learn new and different things. They are inventive, artistic, and curious (McCrae & Costa, 2008; McCrae & John, 1992). The definition of Openness overlaps partially with the common definitions of intelligence, and Openness correlates with intelligence somewhat, but Openness and intelligence are conceptually distinct.

It is important to know how the TCI traits and the Big Five traits are related to each other. According to De Fruyt et al. (2000), Neuroticism is correlated with high Harm Avoidance and low Self-directedness. Extraversion is correlated with low Harm Avoidance, high Novelty Seeking, and high Reward Dependence. Openness is correlated with high Self-transcendence, high Reward Dependence, and low Harm Avoidance. Agreeableness is correlated with high Cooperativeness. Conscientiousness is correlated with high Self-directedness, high Persistence and low Novelty Seeking (De Fruyt, Wiele, & Van Heeringen, 2000).

1.2 Parents, family environment, and child development

Child development has been a target of extensive research over several decades, however, no definitive grand theory of parenting has emerged (O'Connor, 2002). When examining the effects of the family environment on child development (e.g., this study), the common basic needs of children need to be understood. Such common basic needs include physical needs (e.g., food and health care), the need for a stable family environment (e.g., no violence, no family conflict, stable caregiver relationship), and the need for guidance and support (e.g., emotional support, parental structure, and cognitive stimulation) (Dubowitz et al., 2005). There are at least three broad family context factors that can influence child development (Sheffield Morris, Silk, Steinberg, Myers, & Robinson, 2007). The first is learning and modeling of observed parental behavior. The second is the emotional climate in the family (e.g., warm and supportive vs. cold and unsupportive parents). The third is parenting practices, that is, how the parents react to the child's behavior and what the parents expect from the child's behavior. Dysfunctional family environments do not provide children with many of the experiences that are necessary for normal development and adaptation (Cicchetti & Toth, 2005). Children growing up in an environment which fails to provide consistent and appropriate opportunities for development are at increased risk of developing adult psychopathology, especially anxiety and depression (Brewin, Andrews, & Gotlib, 1993; Schilling, Aseltine, & Gore, 2007; Scott, Smith, & Ellis, 2010; Tyrka, Wyche, Kelly, Price, & Carpenter, 2009).

1.3 Early family environment and personality in adulthood

Personality reflects the coherence of behavior and emotions, as well as adaptation of the individual to the environment. Current evidence on the persistence of the effects of childhood environment on adulthood personality is very limited (Mersky & Topitzes, 2010). Most of the existing studies have been based on retrospective recollections of childhood environment (Oshino, Suzuki, Ishii, & Otani, 2007; Reti et al., 2002). These studies suggest that retrospectively reported adverse parental behaviors correlate modestly with high Neuroticism and low Conscientiousness (Hojat & Borenstein, 1990; Lundberg, Perris, Schlette, & Adolfsson, 1999; McCrae & Costa, 1988). In

retrospective studies using TCI, negative parental behaviors have been associated with high Harm Avoidance and low Self-directedness in adulthood (Oshino et al., 2007; Reti et al., 2002; Schlette et al., 1998; Takeuchi et al., 2011). In some studies, negative parental behaviors have been associated with low Reward Dependence (Schlette et al., 1998), low Cooperativeness (Schlette et al., 1998; Takeuchi et al., 2011), low Persistence (Takeuchi et al., 2011), and low Self-transcendence (Takeuchi et al., 2011). However, these studies are subject to recall and common informant biases, i.e. people with different personalities may remember or perceive their childhood experiences differently. Childhood experiences can affect personality development, although personality continues to change and develop in adulthood and through the life span.

1.4 Personality development in adulthood

Personality change is not a simple concept, because there are different ways to define change. According to Roberts et al. (2008) there are four main ways to define personality change. Change between people in a population can be studied using rank-order or mean-level change. Change within an individual can be studied using ipsative change or individual-level change. This study concentrates on rank-order and mean-level change.

Rank-order change means change in relative ranking of individuals within a population (Roberts, Wood, & Caspi, 2008). For example, it is possible that the most neurotic person within a population at a given time has a much lower level of neuroticism after ten years. Despite this, there is no change in this individual's rank order if he/she still is the most neurotic person in the population.

Mean-level change explores whether the level of a certain personality trait changes, on average, in a population (Roberts et al., 2008). If neuroticism lowers in ten years for most people, there is observable mean-level change in neuroticism. Using mean-level change, it can be found out if, for example, 20-year-olds are, on average, more neurotic than 40-year-olds. However, mean-level change cannot be used to describe the total amount of change in a population. If 50% of people decrease and 50% increase strongly on a given trait, mean-level change is zero although there is substantial change within individuals.

Ipsative change corresponds to rank-order change within an individual (Roberts et al., 2008). It explores the configuration of personality traits within an individual over time. If a person is now much more extraverted than agreeable and after ten years much more agreeable than extraverted, he or she has had an ipsative change in personality.

Individual-level change describes how a single individual's single trait changes over time (Roberts et al., 2008). Individual-level change is methodologically challenging, because it is difficult to separate real change from measurement error. The goal is to find out if a person has changed more than would be expected based on chance alone considering the reliability of the personality inventory in question. Different kinds of statistical methods have to be applied to be able to be confident enough that real change in personality has taken place.

How unstable can a trait be so that it can still be called stable? How large a change is of practical significance? These are difficult questions in studying change, because each measurement includes at least some amount of measurement error. This is why two personality measurements almost never correlate perfectly, even if there has not been any real change in personality. This has led some researchers to suggest that personality does not change significantly after the age of 30 (McCrae & Costa, 1994). This view is disputed, however. According to a more recent view, personality is reasonably stable but it can and will change in the life course enough to make a difference in an individual's life (Roberts & Mroczek, 2008; Roberts et al., 2008).

Personality shows moderate or strong rank-order stability in adulthood over time from the perspective of the Five-Factor Model. Correlations over ten years range from 0.4 to 0.6 (Roberts et al., 2008). Correlations of the TCI-traits in adulthood over one or two years range from .68 to .85 (Cloninger, Svrakic, & Przybeck, 2006; Gillespie, Cloninger, Heath, & Martin, 2003). Only a few studies have explored the rank-order stability of the TCI traits so the evidence of their rank-order stability is limited. Two factors, time between measurements and age, affect the magnitude of rank-order stability. The longer the measurement interval, the more rank-order change there is. Also, the magnitude of rank-order change lowers linearly with age up until the age of 50, even though there still is measurable change after the age of 50 (Roberts et al., 2008). The rank-order stability coefficient in young adulthood is about 0.54, at the age of 30 about 0.64, and 0.74 at the age of 50-70 years when the time-interval is fixed at

6.7 years (Roberts & DelVecchio, 2000). There are only small differences between the traits, or between men and women (Roberts et al., 2008). In addition, self-ratings and observer ratings both give very similar results. Even though rank-order stability is rather high, significant change takes place during the whole life-course of an individual.

Research on the mean-level change has revealed that social dominance (a subscale of extraversion) rises with age as does Conscientiousness while Neuroticism decreases (Rantanen, Metsäpelto, Feldt, Pulkkinen, & Kokko, 2007; Roberts, Walton, & Viechtbauer, 2006). Agreeableness rises significantly only at older age, although a modest rise takes place from young adulthood onwards. Openness rises especially in young adulthood but decreases at older age. There are no differences between men and women in mean-level change (Roberts et al., 2008). Research concerning the mean-level change of the TCI traits in adulthood has been mainly cross-sectional. These studies show that by the age of 35 or 40, Self-directedness and Cooperativeness character traits increase but not Self-transcendence (Cloninger et al., 1993). The evidence is somewhat contradictory with some studies providing empirical support for increasing levels of character traits (Cloninger et al., 1993; Cloninger, Svrakic, & Svrakic, 1997; Cloninger, 2003) and some not (Farmer & Goldberg, 2008). Concerning the temperament traits, Novelty Seeking appears to decrease with age while no consistent age-related change has been reported for other temperament dimensions (Cloninger et al., 1993; Cloninger, 2003; Gana & Trouillet, 2003).

Research on ipsative change shows that personality traits of people with high Conscientiousness and Agreeableness and low Neuroticism change less, and the personality profiles are more stable over time than is the case for people with other kinds of profiles (Roberts et al., 2008).

Research on individual-level change has shed light on those people whose personality traits change considerably more or less than the average. It seems that different personality change trajectories are associated with differences in life experiences (Roberts et al., 2008). In addition, personality traits of people with high Conscientiousness and Agreeableness and low Neuroticism change less than for other people (Donnellan, Conger, & Burzette, 2007; Roberts, Caspi, & Moffitt, 2001).

1.5 Ill-being, well-being, and psychological maturity

In this study, depressive symptoms are used as an indicator of a person's ill-being. Well-being is measured mostly from the viewpoint of subjective well-being although measures of subjective health and social support are also included. The concept of psychological maturity is tightly intertwined with well-being. This chapter clarifies the definitions of depression, depressive symptoms, well-being, and psychological maturity, and their relationship with personality.

1.5.1 Depression and subthreshold depression

According to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR), the diagnosis of major depression requires depressed mood and/or loss of interest or pleasure in life activities for at least two weeks and together at least five of the central depression symptoms that cause clinically significant impairment in social, work, or other important areas of functioning almost every day (American Psychiatric Association, 2000). These symptoms can include weight gain or loss, insomnia or sleeping too much, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or excessive guilt, diminished ability to think or concentrate, or indecisiveness, and recurrent thoughts of death or suicide.

It has been estimated, that 5.3% of the world's population and 6.9% of Europe's population suffer from major depressive disorder in one year (Eaton et al., 2008; Wittchen et al., 2011). In Finland, 6.5% of adults experience depression in one year (Pirkola et al., 2005). Consequently, depression is the most important single contributor to the total disease burden in Europe (Wittchen et al., 2011). In the United States, 16.2% of all people suffer from major depression at some point in their life (Kessler et al., 2003).

There are at least three different definitions of subthreshold depression (Ayuso-Mateos, Nuevo, Verdes, Naidoo, & Chatterji, 2010; Cuijpers, Smit, & van Straten, 2007). The second and third definitions are most compatible with the approach taken in this study. In the first, subthreshold depression is a condition categorically different from other depressive symptoms. The definition of minor depressive disorder in DSM-IV is an example of this approach. The second definition sees depression as a

continuum with no symptoms at one end, major depression at the other, and subthreshold depression between them. According to the third view, subthreshold depression is a state that precedes major depression or that follows after recovery from major depression. The idea of this definition is that most people with major depression have gone through a period of subthreshold depression. Research on subthreshold depression is somewhat complicated by the lack of consensus in the criteria that define subthreshold depressive symptoms (Ayuso-Mateos et al., 2010).

There are several reasons why subthreshold depression is important (Ayuso-Mateos et al., 2010; Cuijpers et al., 2007; Fergusson, Horwood, Ridder, & Beautrais, 2005; Goldney, Fisher, Dal Grande, & Taylor, 2004; Lima & Fleck, 2007). People with subthreshold depression have clinically relevant symptoms of major depression disorder but they do not meet the full criteria for this disorder. Subthreshold depression often causes considerable suffering, which frequently requires treatment and leads to increased use of health services. This suffering may also lower the quality of life. Furthermore, people with subthreshold depression are at increased risk of developing major depression. Therefore, it is important to understand the factors that are associated with subthreshold depression.

1.5.2 Depression and personality

Most of the risk factors for depression are either unchangeable (e.g., family background) or predict depression only over a short time (e.g., stressful life events) (Klein, Kotov, & Bufferd, 2011). Personality is relatively stable over time but it can predict depression many years before its actual onset. Personality is also relatively easy to assess, which makes it a useful screening tool in identifying individuals with elevated risk of developing depression. Extensive research has revealed that the personality of depressed individuals differs from non-depressed individuals. This difference has been found both for people with a major depression diagnosis and for people with subthreshold depressive symptoms. Depressed individuals usually have high Neuroticism, high negative emotionality, high Harm Avoidance, low Self-directedness, and they are more likely to be perfectionistic (Bagby, Quilty, & Ryder, 2008; Celikel et al., 2009; Elovainio et al., 2004; Enns & Cox, 1997; Jylhä & Isometsä, 2006; Kendler &

Myers, 2010; Klein et al., 2011; Kotov, Gamez, Schmidt, & Watson, 2010; Nyman et al., 2011; Spittlehouse et al., 2010). Also low Conscientiousness has been found to be associated with depression (Klein et al., 2011; Kotov et al., 2010). High Extraversion is associated with lower levels of depression, especially in the less severe forms of depression (Klein et al., 2011). Most of the personality traits associated with depression are also related to other forms of psychopathology. It may be that the same personality traits can lead to multiple outcomes depending on the subsequent individual events in the causal chain (Klein et al., 2011).

There are at least five possible models to explain the association between personality and depression, and they have been summarized by Bagby et al. (2008) and Klein et al. (2011). The first is the vulnerability model, which suggests that personality traits predispose people to develop depression. Thus, a certain kind of personality makes it more likely for a person to develop depression. The second possibility is the pathoplasty model, according to which personality affects the way depression is expressed. That is, personality affects the onset, severity, or course of depression, as well as the response to treatment, but not the probability of developing depression disorder per se. The third model is the scar model, which proposes that depression leads to a change in personality. This change may be transient or permanent. The central idea of the model is that extreme personality profiles are the result of depression and not vice versa. The fourth model is the so-called spectrum model, which suggests that personality and depression reside on the same continuum. According to this model, extreme pathological personality is more or less the same as having a depression disorder. The fifth model is the common cause model, which suggests that personality and depression share a common etiological factor. For example, the same genes that give rise to certain personality traits might also predispose a person to depression although personality and depression are conceptually distinct constructs (Bagby et al., 2008; Klein et al., 2011).

1.5.3 Well-being and psychological maturity

Well-being, generally speaking, is a multidimensional concept that includes various aspects of mental and physical health, supporting social relationships, and the ability to cope with stressful situations (McDowell, 2010; Stokes, Noren, & Shindell, 1982). Even

subjectively evaluated well-being is a very useful measure since it correlates rather well with objectively measured well-being (Oswald & Wu, 2010). Considering the mental aspect of well-being, the current view is that mental well-being and ill-being represent different dimensions and not the opposite poles of the same continuum (Dagenais-Desmarais & Savoie, 2012). Thus, well-being is much more than just absence of illness (Ruini et al., 2003). For example, disability seems to increase ill-being but influences positive well-being less. Furthermore, lack of positive well-being predicts 7-year mortality more strongly than the presence of ill-being (Huppert & Whittington, 2003).

There are two influential views on the concept of mental well-being. The first is subjective (or hedonic) well-being, which defines well-being as high positive affect, low negative affect, and high life satisfaction (e.g., Diener, 1984). Subjective well-being was the first model of well-being that had a systematic theory behind it and was also a subject of systematic empirical research (Waterman et al., 2010). The second model is eudaimonic well-being which defines well-being in terms of optimal functioning and self-actualization (e.g., Waterman, 1993). The eudaimonic view emphasizes that being happy (subjective well-being) does not necessarily translate into being psychologically well (Deci & Ryan, 2008). These two concepts of well-being differ in the way they approach the concept of the good life (Waterman, 2007). Subjective well-being sees "hedonia" as the goal to be sought without considering the source of happiness. In the eudaimonic view, happiness is the by-product of the pursuit of self-realization (excellence in the development and use of talents) rather than the objective to be sought. According to Waterman (1993, p. 679), eudaimonic well-being is likely to increase if there is "(a) an unusually intense involvement in an undertaking, (b) a feeling of a special fit or meshing with an activity that is not characteristic of most daily tasks, (c) a feeling of being intensely alive, (d) a feeling of being complete or fulfilled while engaged in an activity, (e) an impression that this is what the person was meant to do, and (f) a feeling that this is who one really is". Subjective and eudaimonic well-being are competing models which has led some researchers to suggest an integrative model to mental well-being with aspects from both models to capture the full range of mental well-being (Dagenais-Desmarais & Savoie, 2012; Ryan & Deci, 2001). This study explores well-being mostly in the light of subjective well-being. Well-being is further

divided into affective and non-affective well-being to separate positive and negative emotions from the social and health related aspects of well-being.

Psychological maturity, in turn, is a somewhat ambiguous concept that attempts to describe directions and end states of personality development that are psychologically healthier and more fulfilling than lower levels of psychological maturity. Developmental theories offer two different views on maturity (Caspi, Roberts, & Shiner, 2005; Helson & Wink, 1987). The perspective of personal growth concentrates on concepts such as insight, integrity, and wisdom. Personal growth is seen as positive development that enables the individual to actualize his or her full potential as a person (Staudinger & Kunzmann, 2005). The functional perspective, on the other hand, equates maturity with adjustment to society, that is, being a productive contributor to society and being respected and liked by other people (Hogan & Roberts, 2004).

1.5.4 Personality in relation to well-being and maturity

Having good enough health and income are necessary but not sufficient requirements for subjective well-being (DeNeve & Cooper, 1998, Steel et al., 2008). In addition, life events seem to affect one's present mood but do not have a large effect in the long run (Steel, Schmidt, & Shultz, 2008). Personality, on the other hand, is an important predictor of subjective well-being (Diener, Oishi, & Lucas, 2003; Ruini et al., 2003). Personality affects, for example, how people perceive life events. Perceptions of the same events can be negative or positive depending on personality (DeNeve & Cooper, 1998). The link between personality and well-being may also explain the finding that when people or countries become wealthier, well-being often does not improve (Ryan & Deci, 2001; Steel et al., 2008). Also, countries that value individualism seem to have a higher average level of well-being possibly because in individualistic countries people are free to act according to their personalities (Fischer & Boer, 2011). Of all the Big Five traits, Neuroticism is most strongly associated with subjective well-being; high Neuroticism is associated with having high negative affect, low positive affect, and low life satisfaction (Karademas, 2007). Therefore, high Neuroticism is associated with having low subjective well-being.

The psychobiological theory of personality defines maturity as the character configuration typical of healthy middle-aged individuals, which is characterized by high

Self-directedness and high Cooperativeness (Cloninger et al., 1993; Cloninger et al., 1997). Of the TCI traits, especially high Self-directedness has been found to be associated with higher levels of well-being, but also high Cooperativeness and high Self-transcendence can increase well-being (Cloninger & Zohar, 2011; Garcia, 2011). All in all, personality factors that enhance social relationships and success in achieving important personal goals seem to increase subjective well-being (DeNeve & Cooper, 1998; Romero, Villar, Angeles Luengo, & Gomez-Fraguela, 2009).

2 AIMS OF THE STUDY

This study aims at understanding the development and outcomes of personality in terms of the psychobiological personality theory. According to this theoretical approach, the possible difference between temperament and other personality traits is an important question. Personality profiles are also an important concept. Human personality is a combination of many traits, and single traits give only limited information of one's personality. Using personality profiles makes it possible to understand processes within individuals and not just variation between individuals. The effect of one's childhood environment on personality in adulthood is a much discussed topic. It is not very well known how normal variation in the childhood family environment is associated with personality in adulthood. Well- and ill-being are important concepts from the viewpoint of public health and the functioning of the whole society. Understanding the link between personality and well- and ill-being should help in promoting well-being and in decreasing ill-being. Longitudinal research is needed to evaluate causal relationships between different factors, and to help in understanding human development and the growth of psychological maturity over time. A large number of participants and a longitudinal research design are the main strengths of this study.

2.1 Study Questions

The topics and study questions are as follows.

2.1.1 Study I

Do personality traits develop towards greater psychological maturity with age?
Do temperament traits follow a different kind of developmental trajectory than character traits?
Do the initial levels of personality traits predict the magnitude of personality change over time?

2.1.2 Study II

Is the childhood and adolescence family environment differently associated with temperament and character traits in adulthood?

Do parental care-giving and the home environment predict offspring's personality traits over 18 years?
Is the combination of different parental environment variables a stronger predictor of the offspring's personality traits than single variables?

2.1.3 Study III

Are personality profiles associated with cross-sectional affective and non-affective well-being?

2.1.4 Study IV

Are personality profiles associated with depressive symptoms cross-sectionally and longitudinally?

Figure 1 illustrates the structure and study questions of this study.

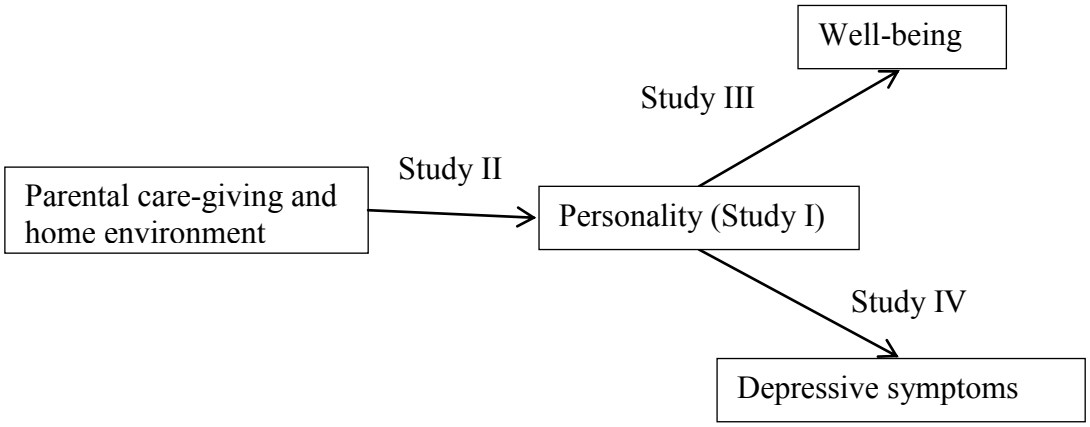

Figure 1: Illustration of the study

3 METHODS

3.1 Participants: The Cardiovascular Risk in Young Finns Study

The research design and basic characteristics of the study samples are shown in Table 1.

Table 1. Research design and basic characteristics of the study samples

	Study I	Study II	Study III	Study IV
Research design	Longitudinal	Longitudinal	Cross-sectional	Longitudinal
Women (%)	1565 (55.6)	632 (58.4)	1118 (57.6)	1144 (59.9)
Men (%)	1249 (44.4)	451 (41.6)	822 (42.4)	767 (40.1)
Total	2814	1083	1940	1911

All participants in this dissertation came from The Cardiovascular Risk in Young Finns Study, which started in 1980. It is an ongoing follow-up study that maps the coronary heart disease factors in Finnish children, adolescents, and adults. The participants were selected randomly in all five Finnish university cities with medical schools and their rural surroundings from six different age cohorts in the population register of the Social Insurance Institution, a database covering the whole population of Finland. The variation in the participants' socioeconomic background and living conditions represent reasonably well all Finnish children and adolescents (Raitakari et al., 2008). The study cohorts were 3, 6, 9, 12, 15, and 18 years old in 1980. Altogether 4,320 people were chosen and 3,596 (83%, 1,832 boys and 1,764 girls) of them participated in the first study in 1980. There have been 8 follow-up studies with psychological variables in 1983, 1986, 1989, 1992, 1997, 2001, 2007, and 2012.

In study I, all participants with full personality data (seven trait variables) in at least one of the years 1997, 2001, and 2007 were included. In study II, only two-parent families were included to study the effect of both the mother and the father on the offspring's personality. Full data was required, so participants with missing data in any of the study variables in 1983 or 2001 were removed. In study III, all participants with full personality data (three trait variables) in 2001 and full well-being data (six variables) in 2001 were included. In study IV, all participants with full personality data

(seven trait variables) in 1997 and depression data in at least one of the years 199, 2001, and 2007 were included.

Three of the four studies in this dissertation had a longitudinal research design. Longitudinal studies always have at least a little attrition. The main reasons for non-participation in the Young Finns Study include lack of interest in the study, unwillingness of the child to participate, and lack of time (Raitakari et al., 2008). In 2001, 72.9% of the original participants in 1980 returned follow-up questionnaires. Non-participants have more often been men and somewhat younger than the participants. Otherwise, no systematic significant differences between the non-participants and participants have been reported (Raitakari et al., 2008).

3.2 Measures

3.2.1 Temperament and character inventory (Studies I-IV)

Personality was measured using the 240-item version 9 of the Temperament and Character Inventory (TCI) (Cloninger et al., 1994). Instead of the original true/false response format, a 5-point Likert scale was used with response categories ranging from 1) absolutely false to 5) absolutely true. Temperament dimensions include Harm Avoidance (HA; 35 items, Cronbach's α=0.92), Novelty Seeking (NS; 40 items, α=0.85), Reward Dependence (RD; 24 items, α=0.80) and Persistence (PS; 8 items, α=0.64). Character dimensions include Self-directedness (SD; 44 items, α=0.89), Cooperativeness (CO; 42 items, α=0.91) and Self-transcendence (ST; 33 items, α=0.91). All temperament and character dimensions were standardized to have a mean of 0 and a standard deviation of 1.

3.2.2 Personality profiles (Studies III and IV)

Personality profiles were formed separately for temperament (HA, RD, and NS) and character (SD, CO, and ST) following the example of previous studies. First, the participants were divided into subjects above and below the median for each TCI-trait. After this the participants were grouped according to all the possible combinations of high and low character or temperament scores to define the 8 possible character and 8 possible temperament configurations. An upper case letter indicates being above the

median and a lower case letter being below the median on a given trait. The eight character profiles are creative (SCT), organized (ScT), fanatical (ScT), autocratic (Sct), moody (sCT), dependent (sCt), disorganized (scT), and depressive (sct). The eight temperament profiles are sensitive (NHR), explosive (NHr), passionate (NhR), adventurous (Nhr), cautious (nHR), methodical (nHr), reliable (nhR), and independent (nhr).

3.2.3 Parental care-giving and home environment (Study II)

Care-giving and home-environment in childhood and adolescence were measured using five variables: hostile maternal care-giving environment, family's socioeconomic status, age of parents at the time of birth, unhealthy habits of parents, and parental role dissatisfaction. Age of parents, parental habits, and parental dissatisfaction were acquired from both the mother and the father. Altogether, there were eight parental variables.

The maternal hostile care-giving environment was self-rated by mothers in 1983. The scale consists of nine items measured on a 5-point scale. The items assess three dimensions: (a) the child's low emotional significance to the mother (e.g., "The child is significant to me," 1 = very significant, 5 = not significant, (b) the strict disciplinary style of the mother (e.g., "Disciplinary actions are regularly needed," 1 = totally disagree, 5 = totally agree), and (c) the mother's low tolerance toward the child (e.g., "In difficult situations, the child is a burden," 1 = totally disagree, 5 = totally agree).

Family's socioeconomic status (SES) was assessed in 1983. SES was measured by two indices: (a) the mother's and father's years of education (standardized z-score) and (b) the annual income of the household (measured on an eight-point scale standardized as a z-score). The Z-scores of education and income were summed.

The unhealthy life habits of parents were self-rated by mothers and fathers in 1983. The scale consists of four items: (1) alcohol use, (2) smoking, (3) body mass index and (4) free-time physical exercise. Alcohol use was measured by asking "how often do you use alcohol so that you become intoxicated?" It was rated on an eight-point scale (1 = daily, 7 = 3-4 times a year and 8 = never). Smoking was measured by asking "which of the following options describes best your current smoking habits?" It was rated with the

following scale 1 = I smoke daily, 2 = I smoke occasionally, 3 = I do not smoke. Body mass index was calculated by dividing weight (kg) by height (m) squared. Weight and height were measured by a nurse. Free-time physical exercise was measured by asking "how often do you do physical exercise in your free-time?" It was rated on a six-point scale (1 = daily, 5 = once a month or less frequently, 6 = I do not do free-time physical exercise). Each of the four measures were re-coded as dichotomous (0 = healthy or 1 = unhealthy). We used the following cutoff points. For alcohol use 8 = never and 7 = 3-4 times a year were coded as healthy. Options from 1 = daily to 6 = once in every two months were coded as unhealthy. For smoking, never smoking was coded as healthy and smoking occasionally or daily as unhealthy. For body mass index everyone above 25 (the World Health Organization's cutoff point for overweight) was coded as unhealthy and everyone below 25 as healthy. For free-time physical exercise (6) no free-time physical exercise was coded as unhealthy and all other options as healthy. These four recoded items were summed to form the parental unhealthy life style variable (range from 0 to 4) separately for mothers and fathers.

Parental role dissatisfaction was self-rated by mothers and fathers in 1983. The scale consists of two items: dissatisfaction as a parent, and dissatisfaction as a spouse. Dissatisfaction as a parent was measured by asking: "evaluate yourself as a mother/father". A five-point scale was used (1 = satisfied, 5 = not satisfied). Dissatisfaction as a spouse was measured by asking: "evaluate yourself as a spouse". A five-point scale was used (1 = satisfied, 5 = not satisfied). The variables were recoded as dichotomous variables (0 = satisfied or 1 = unsatisfied). The following cutoff points were used. For both dissatisfaction as a parent and dissatisfaction as a spouse, 1 = satisfied and 2 = rather satisfied were coded as satisfied. Options from 3 = not satisfied not unsatisfied to 5 = unsatisfied were coded as unsatisfied. The two recoded items were summed to form the parental role dissatisfaction variable separately for the mother and the father.

3.2.4 Cumulative risk-factor index in childhood and adolescence (Study II)

Cumulative risk-factor index was formed as a combination of all the 8 paternal and/or maternal risk-factors (range between 0 = no risk factors and 8 = all eight parental risk factors). The presence of an individual risk factor was based on dichotomized variables

(present vs. not present). Dichotomization for the continuous variables (age of parents at the time of birth, family SES, and hostile care-giving) was done by using mediansplit. Parental dissatisfaction was coded as 0 if no dissatisfaction was reported and 1 otherwise. Unhealthy habits were coded as 0 if there was at most one reported unhealthy habit and 1 otherwise.

3.2.5 Positive affect (Study III)

Positive affect was measured using the mood dimension of Revised Dimensions of Temperament Survey (DOTS-R) (Windle & Lerner, 1986). It has seven items and high scorers are characterized by high levels of positive affect (e.g., smiling and being cheerful) (Windle & Lerner, 1986). A 5-point Likert scale was used. To have uncorrelated measures of positive and negative affect, positive affect was regressed on negative affect and the residuals were used as a measure of positive affect in this study.

3.2.6 Negative affect (Study III)

Negative affect was assessed with the negative emotionality dimension of the EAS temperament inventory (Buss, 1991). It consists of two subcomponents, namely anger and fear. Anger has seven items and fear five.

3.2.7 Life satisfaction (Study III)

Life satisfaction was assessed with one item asking "how satisfied are you with your life?" It was rated (1) very satisfied, (2) rather satisfied, (3) not satisfied not unsatisfied, (4) rather unsatisfied or (5) very unsatisfied. This original scale was reversed for the statistical analyses in this study (i.e., (1) very satisfied was recoded as (5) etc.)

3.2.8 Social support (Study III)

Social support was assessed with the Multidimensional Scale of Perceived Social Support (MSPSS) (Zimet, Dahlem, Zimet, & Farley, 1988). It includes four items to assess perceived support from friends, four items about family support, and four items about support by a significant other. The 12 items were rated on a 5-point Likert scale.

3.2.9 Subjective health (Study III)

Subjective health was assessed with one item asking "what is your health like compared to others of your age?" It was rated with the following scale (1) very good , (2) rather good , (3) average, (4) rather bad , (5) very bad. This original scale was reversed for the statistical analyses in this study (i.e., (1) very good was recoded as (5) etc.)

3.2.10 Composite health index (Study III)

The Composite Health Index (CHI) provides a summary of perceived non-affective well-being (i.e., "wellness"). It was calculated as the mean of life satisfaction, social support and subjective health in standard form.

3.2.11 Happiness index (Study III)

The Happiness Index (HI) provides a summary of perceived affective well-being (i.e., "happiness"). It is defined by the presence of positive emotion and the absence of negative emotion and was calculated by subtracting the measure of negative affect from positive affect in standard form.

3.2.12 Depressive symptoms (Studies III and IV)

Depressive symptoms were assessed using a modified version of Beck's Depression Inventory (Beck & Steer, 1987) (years 1997, 2001, and 2007) and the original Beck's Depression Inventory-II (BDI-II) (year 2007). The modified inventory was called "mild depressive symptoms". In the original version of the BDI, subjects were asked to choose between one of four alternative descriptions of 21 items, with the descriptions of each item ranging from minimal to severe symptoms of depression. In the modified version, the participants were asked to rate the second mildest descriptions of the original 21 items (e.g., "I often feel sad") on a five-point scale ranging from totally disagree (1) to totally agree (5). Originally, these second mildest items were selected because they were expected to most accurately measure depressive symptoms among the normal population.

In addition to mild depressive symptoms, in 2007 depressive symptoms were assessed using BDI-II. BDI-II measures self-reported depressive symptoms in

adolescents and adults according to DSM-IV criteria for diagnosing depressive disorders (Beck, Steer, Ball, & Ranieri, 1996). Each of the 21 items is rated on a four-point scale ranging from 0 to 3 and the total sum score can range from 0 to 63. Scores from 0 to 13 represent "minimal" depression, scores from 14 to 19 are "mild", scores from 20 to 28 are "moderate", and scores from 29 to 63 are "severe".

3.3 Statistical analyses

In study I, when exploring mean-level stability and change of the TCI traits, participants were divided into 5-year age groups. This resulted in five age groups for temperament (20-24, 25-29, 30-34, 35-39 and 40-45 years) and four for character (20-24, 25-29, 30-34 and 35-39 years). In order to examine longitudinal and within-individual associations, the repeated measurements were pooled into a multilevel format in which measurements were nested within participants. The associations were analyzed with a multilevel linear model (generalized estimating equations with unstructured error structure). Age was modeled both as a categorical and continuous variable. To assess aging effects within individuals, we fitted regression models with both within-individual and between-individual associations with the model: $Y = B0 + BW (X – XM) + BB*XM$ (Carlin, Gurrin, Sterne, Morley, & Dwyer, 2005), where Y = trait score, B0 = intercept, BW = within-individual coefficient, X = participant's time-varying age, XM = participant's mean age across all measurements, BB = between individuals coefficient. Here the within-individual coefficient is the association of interest, because it reflects an aging effect within individuals that is not confounded by stable differences between individuals (e.g., cohort effects). To facilitate interpretation of effect sizes, all temperament and character traits were standardized using the mean and standard deviation of the 20-year-old group as the reference. The hypothesis of personality maturity being associated with lesser personality change (Study I) was assessed between the 1997 and 2001 measurements. The degree of personality change was defined as the Euclidean distance between personality trait scores in 1997 and in 2001 (standardized to the mean and standard deviation of the traits in 1997). The distance was calculated separately for a) character traits, b) temperament traits, and c) character and temperament combined. The Euclidean distance in seven-dimensional TCI personality

space using the trait change scores from 1997 to 2001 is (NS_change2 + HA_change2 + RD_change2 + PS_change2 + SD_change2 + CO_change2 + ST_change2)$^{1/2}$.

In study II, linear regression analysis was used to explore the relationship between parental care-giving and family environment and the child's personality in adulthood. Sex and birth year of the child were controlled in all analyses. ANOVA was used to analyze the association between the cumulative risk index and the child's personality in adulthood.

In study III, analysis of variance and Bonferroni-corrected post hoc comparisons were used to study the linear relationship between personality profiles and well-being. Linear regression analysis was used to study the relationship of continuous character scores and well-being. Interactive associations of the character traits with well-being were studied with t-tests performed for the character profiles.

In study IV, Analysis of variance (ANOVA) was used to examine differences between personality profiles. Sex and birth year were controlled when analyzing the profile differences. Profile comparisons were based on estimated marginal means, which were adjusted for sex and birth year. These adjustments were made because the original profiles were based on median scores unadjusted for sex and birth year. Bonferroni correction was used to correct for the multiple comparisons. We also used LSD correction (equal to individual *t*-tests) when comparing different profiles.

4 RESULTS

4.1 Personality development in adulthood (Study I)

As Figures 2 and 3 show, the mean level of character traits changed more over time than that of temperament traits. Of the temperament traits, Novelty Seeking changed most over time (a decrease of about 0.4 standard deviations by age 40-44 compared to the 20-year-olds). All three character traits showed stronger evidence of change over time than any of temperament traits. Self-directedness, and Cooperativeness increased strongly with age with an increase of 0.7 and 0.4 standard deviations by the age of 35-39 years, respectively. Self-transcendence showed a decrease of 0.7 standard deviations by the age of 35-39 years. Controlling for the birth year increased the mean score estimates of the three character traits but not the mean-score estimates of the temperament traits. Further analyses revealed that younger birth cohorts had higher Self-directedness, higher Cooperativeness, and lower Self-transcendence than the older birth cohorts. This is why adjusting for birth year amplified the age effects substantially for the character traits but not for the temperament traits (Figures 2 and 3).

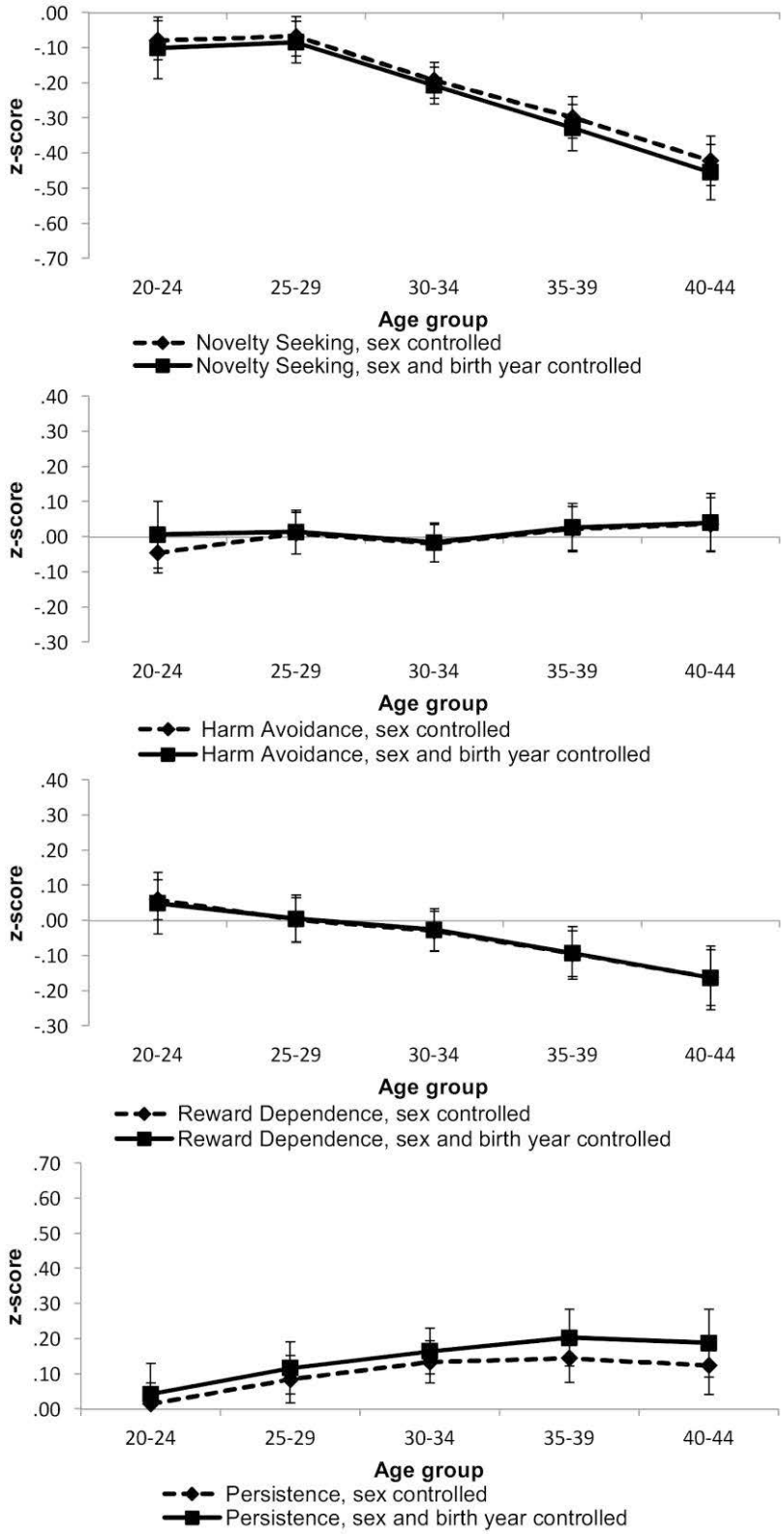

Figure 2: Population z-scores plotted against age group for temperament traits. Scores are standardized to the mean and standard deviation of the 20-year-olds. 95% confidence intervals included. Results based on a multilevel model.

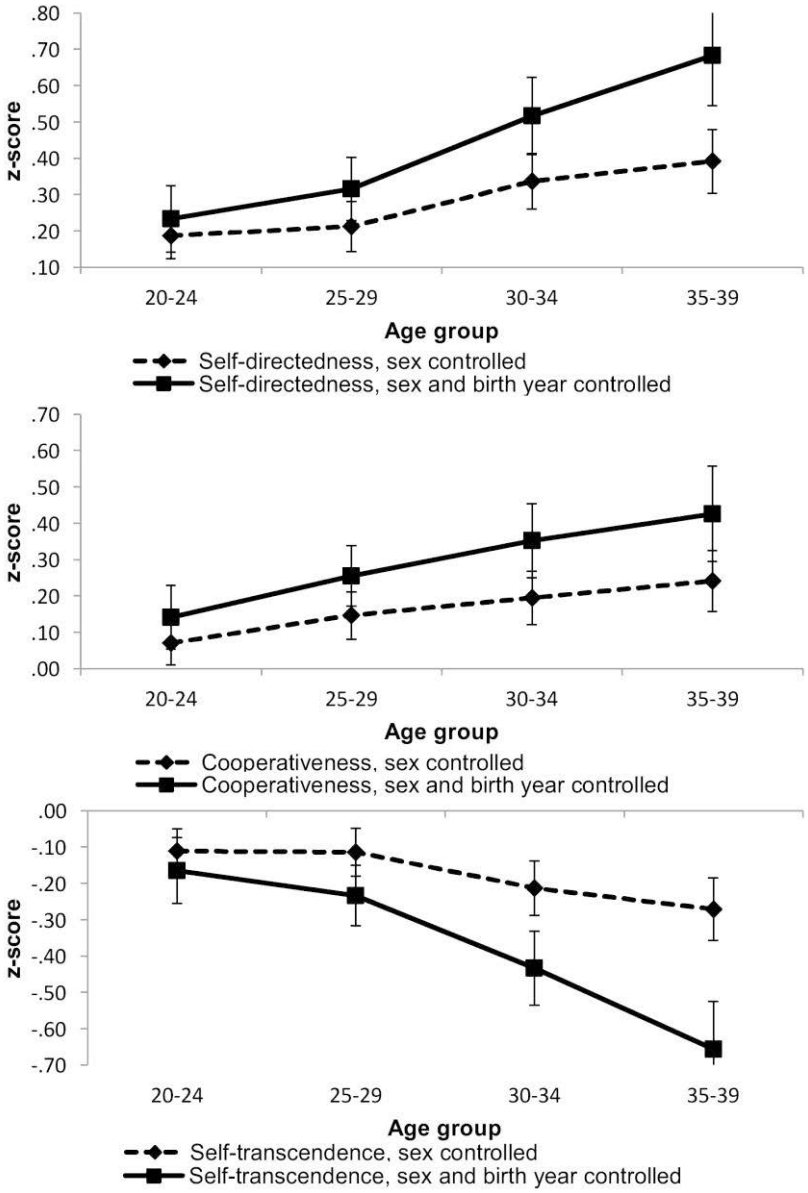

Figure 3: Population z-scores plotted against age group for character traits. Scores are standardized to the mean and standard deviation of the 20-year-olds. 95% confidence intervals included. Results based on a multilevel model.

Table 2 shows the standardized mean scores of the TCI-traits in 1997 predicting total personality change (a positive coefficient indicating that people high on a given trait change more and a negative one indicating that people high on a given trait change less) from 1997 to 2001. High Novelty Seeking, high Persistence, and high Self-transcendence predicted a consistently larger overall change in personality. The largest change in total personality was predicted by high Self-transcendence. Cooperativeness predicted overall change in character traits; low Cooperativeness predicted larger change in character. Self-directedness did not predict overall change in temperament but it did predict change in character and combined temperament and character; low Self-directedness predicts larger change in combined temperament and character and in character.

Concerning the rank order correlations, except for Persistence, both temperament and character had rather high correlations of >.70. Furthermore, the 10-year correlations of temperament were comparable in magnitude to that of shorter time intervals, suggesting little attenuation with the lengthening of the time interval. There was a clear increasing trend in the correlation coefficients with age; correlations in the age group 29-35 were higher than in the age group 20-26 in almost all the comparisons, although the age-group differences were statistically significant only for Novelty Seeking and Harm Avoidance.

Table 2: Trait scores in 1997 predicting the total change of all the TCI traits, character traits, and temperament traits from 1997 to 2001

	All traits			Character			Temperament		
TCI-trait	B	SE	p	B	SE	p	B	SE	p
Novelty Seeking	.09	.02	< .01	.06	.02	< .01	.06	.02	< .01
Harm Avoidance	.00	.02	.90	.01	.02	.75	-.01	.02	.60
Reward Dependence	-.01	.02	.59	.00	.02	.81	.00	.02	.44
Persistence	.05	.02	.01	.03	.02	.04	.03	.02	.03
Self-directedness	-.05	.02	<. 01	-.08	.02	< .01	.00	.02	.91
Cooperativeness	-.01	.02	.61	-.05	.02	< .01	.03	.02	.10
Self-transcendence	.11	.02	<.01	.11	.02	< .01	.05	.02	<.01

Note. B = total change in standard deviations per one standard deviation difference on a given trait

Age was controlled

Total change defined as the Euclidean distance (see Methods) which is always positive.

4.2 Parental care-giving and home environment and the offspring's personality (Study II)

The results of this 18-year prospective study showed that, according to regression analysis, the effects of single parental variables were small. Maternal dissatisfaction was the strongest predictor of the offspring's temperament explaining, at best, 0.9% of the variance in HA and RD. Hostile maternal care-giving was the strongest predictor of the offspring's character explaining 2.2% of the variance in SD and 1.9% in CO. All maternal variables together explained, at best, 1.4% of the variance in temperament (RD) and 5.2% of the variance in character (SD). All paternal variables explained, at best, 0.7% of the variance in temperament (HA), and 2.4% of the variance in character (SD).

Figures 4 and 5 show the cumulative effect of all parental risk variables on the offspring's personality. The levels of Novelty Seeking, Persistence, and Self-transcendence were not associated with the number of risk factors. There were differences in Harm Avoidance ($p = 0.05$), Reward Dependence ($p < 0.01$), Self-directedness ($p < 0.01$), and Cooperativeness ($p < 0.01$) according to the level of risk factors. Linear contrast showed that these associations followed a linear trend so that the level of Harm Avoidance ($p = 0.02$) increased and the level of Reward Dependence ($p <$

0.01), Self-directedness ($p < 0.01$), and Cooperativeness ($p < 0.01$) decreased along with increasing cumulative childhood burden. According to regression coefficients, cumulative risk was more strongly associated with character (B = -0.12 for Self-directedness and B = -0.10 for Cooperativeness) than with temperament (B = 0.06 for Harm Avoidance and B = -0.06 for Reward Dependence).

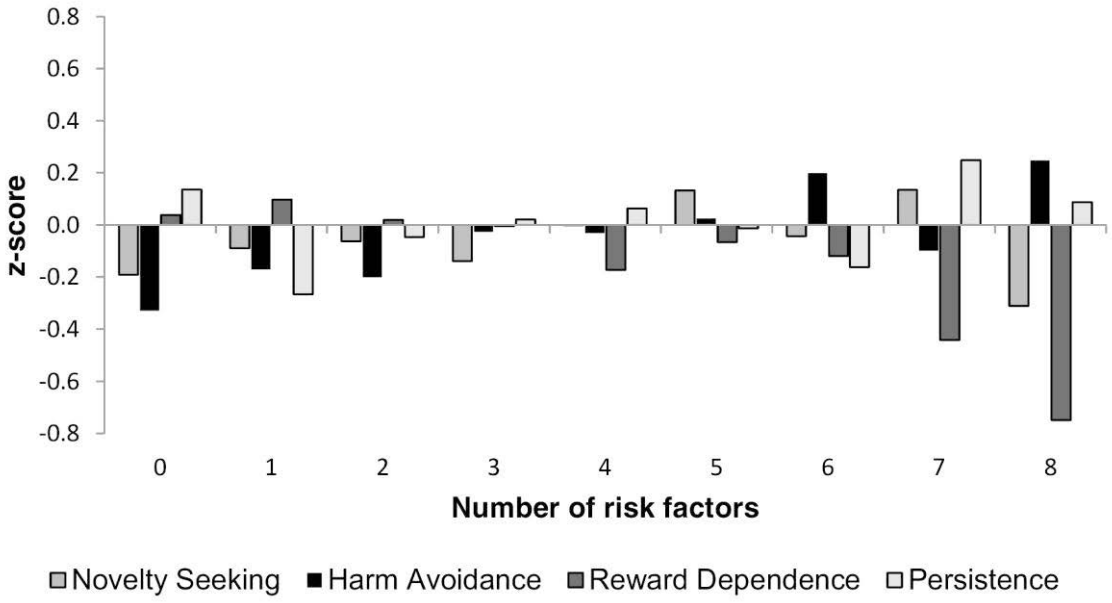

Figure 4: Standardized scores (mean = 0, SD = 1) of the child's temperament traits in 2001 grouped by the number of parental risk factors in 1983. Sex and birth year were controlled. Results of ANOVA: NS ($F(8,1068) = 1.47$, $P = 0.16$), HA ($F(8,1068) = 1.98$, $P = 0.05$), RD ($F(8,1068) = 2.79$, $P < 0.01$), PS ($F(8,1068) = 1.53$, $P = 0.14$). Linear contrasts: NS ($P = 0.73$), HA ($P = 0.02$), RD ($P < 0.01$), PS ($P = 0.47$). Regression coefficients (number of parental risk factors as the independent variable): NS (B = 0.03, $P = 0.07$), HA (B = 0.06, $P < 0.01$), RD (B = -0.06, $P < 0.01$), P (B = 0.02, $P = 0.38$).

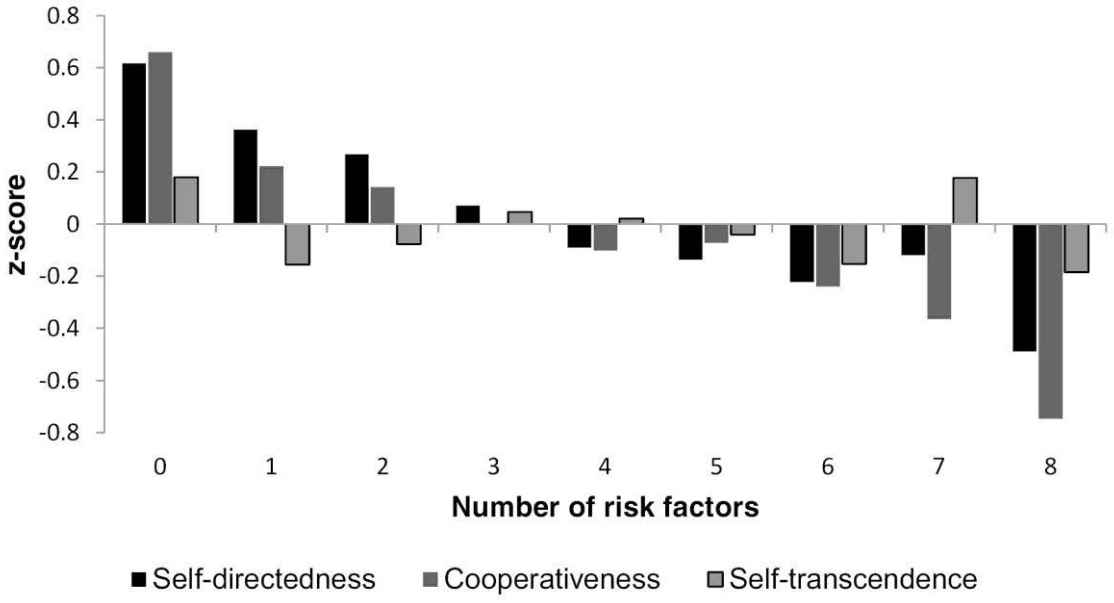

Figure 5: Standardized scores (mean = 0, SD = 1) of the child's character traits in 2001 grouped by the number of parental risk factors in 1983. Sex and birth year were controlled. Results of ANOVA: SD ($F(8,1068) = 5.79$, $P < 0.01$), CO ($F(8,1068) = 5.06$, $P < 0.01$), ST ($F(8,1068) = 1.06$, $P = 0.39$). Linear contrasts: SD ($P < 0.01$), CO ($P < 0.01$), ST ($P = 0.63$). Regression coefficients (number of parental risk factors as the independent variable): SD (B = -0.12, $P < 0.01$), CO (B = -0.10, $P < 0.01$), ST (B = 0.00, $P = 0.90$).

4.3 Personality and well-being (Study III)

As can be seen in Tables 3 and 4, Self-directedness and Cooperativeness were strong and consistent predictors of both affective and non-affective well-being. The largest effect sizes for both SD and CO could be found in happiness. The effect sizes for SD were over one standard deviation and 0.5–0.7 standard deviations for CO. Self-transcendence was associated with negative and positive affect (effect sizes 0.2–0.3 standard deviations) but not with HI or CHI. The creative (SCT) and organized (SCt) profiles showed the most evidence of high levels of well-being. The depressive (sct) and disorganized (scT) profiles showed the most evidence of low levels of well-being.

Figure 6 shows the associations of character profiles with the extremes of non-affective well-being. The top sixth and the bottom sixth of the distribution of the CHI were selected and named "best health" and "worst health" respectively. The profile

groups differed significantly in the proportion that had "best health" ($\chi^2 = 171.27$, df = 7, $p < 0.001$) and "worst health" ($\chi^2 = 224.06$, df = 7, $p < 0.001$). These results are due to the strong impact of Self-directedness and Cooperativeness on overall well-being with lesser influence from Self-transcendence. The percentage of people who had the worst health increased steadily from moody (sCT), dependent (sCt) and disorganized (scT) profiles to depressive (sct) profile. Individuals with creative (SCT) or organized (SCt) profile were frequently in the best of health and only rarely had the worst health.

The overall influence of the three character variables on affective and non-affective well-being was assessed by using regression analysis. HI or CHI was used as the dependent variable and the three character traits were used as independent variables. TCI character explained 56% of the variance in non-affective well-being (CHI, R square 0.557, F = 290.44, $p < 0.001$) and 65% in affective well-being (HI, R square 0.654, F = 481.28. $p < 0.001$). For HI, when all three character traits were in the same regression model, the linear influence of Self-directedness was strong (beta = 0.53, t = 24.71, $p < 0.001$), Cooperativeness was weaker but still highly significant (beta = 0.19, t = 8.92, $p < 0.001$) and Self-transcendence was weak but significant (beta = 0.05, t = 2.84, $p = 0.005$). For CHI, when all three character traits were in the same regression model, the linear effect of Self-directedness was also strong (beta = 0.51, t = 21.55, $p < 0.001$), Cooperativeness was weaker than for HI but still significant (beta = 0.09, t = 3.70, $p < 0.001$) and Self-transcendence was about the same magnitude as Cooperativeness (beta = 0.08, t = 3.91, $p < 0.001$). When only Self-directedness was used to predict non-affective well-being in regression analysis, 30% was explained. In affective well-being Self-directedness alone explained 40% of the variance. Cooperativeness explained 14% of the variance in non-affective well-being when used as the only predictor in linear regression analysis. In addition, Cooperativeness explained 24% of the variance in affective well-being. Cooperativeness was a weaker predictor of non-affective and affective well-being than Self-directedness but still important. According to linear regression analyses, Self-transcendence had a negligible effect on well-being when used as the only predictor, explaining 0% of affective and non-affective well-being.

Table 3: Descriptive statistics for Composite Health Index (CHI), Happiness Index (HI), and positive and negative affect by character profile

Character profile	CHI		HI		Positive affect		Negative affect	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
SCT	0.39	0.03	0.91	0.06	0.47	0.05	-0.44	0.04
SCt	0.37	0.03	0.89	0.06	0.23	0.05	-0.66	0.04
ScT	0.25	0.06	0.21	0.14	0.05	0.11	-0.16	0.10
Sct	0.15	0.05	0.29	0.09	-0.21	0.07	-0.50	0.06
sCT	-0.15	0.06	-0.21	0.10	0.13	0.09	0.34	0.07
sCt	-0.19	0.07	-0.41	0.14	-0.14	0.11	0.273	0.09
scT	-0.33	0.04	-0.87	0.07	-0.24	0.05	0.632	0.05
sct	-0.43	0.04	-0.88	0.07	-0.40	0.06	0.477	0.05

SCT = creative; SCt = organized; ScT = fanatical; Sct = autocratic; sCT = moody; sCt = dependent; scT = disorganized; sct = depressive

Table 4: Comparisons between character profiles in standardized measures of Happiness Index (HI), Composite Health Index (CHI), and positive and negative affect

	HI		CHI		Negative affect		Positive affect	
	MD	p	MD	p	MD	p	MD	p
Self-directedness								
SCT vs. sCT	1.12	< 0.01	0.54	< 0.01	- 0.78	< 0.01	0.34	< 0.01
SCt vs. sCt	1.30	< 0.01	0.56	< 0.01	- 0.93	< 0.01	0.37	< 0.01
ScT vs. scT	1.08	< 0.01	0.59	< 0.01	- 0.80	< 0.01	0.29	0.01
Sct vs. sct	1.17	< 0.01	0.58	< 0.01	- 0.98	< 0.01	0.19	0.03
Cooperativeness								
SCT vs. ScT	0.70	< 0.01	0.14	0.04	- 0.27	< 0.01	0.42	< 0.01
SCt vs. ScT	0.60	< 0.01	0.22	< 0.01	- 0.16	0.04	0.44	< 0.01
sCT vs. scT	0.66	< 0.01	0.19	< 0.01	- 0.29	< 0.01	0.37	< 0.01
sCt vs. sct	0.47	< 0.01	0.25	< 0.01	- 0.20	0.05	0.26	0.03
Self-transcendence								
SCT vs. SCt	0.02	0.83	0.02	0.59	0.22	< 0.01	0.24	< 0.01
ScT vs. Sct	- 0.08	0.62	0.10	0.17	0.34	< 0.01	0.26	0.04
sCT vs. sCt	0.20	0.25	0.04	0.66	0.07	0.55	0.27	0.06
scT vs. sct	0.01	0.96	0.09	0.09	0.16	0.03	0.16	0.03

SCT = creative; SCt = organized; ScT = fanatical; Sct = autocratic; sCT = moody; sCt = dependent; scT = disorganized; sct = depressive

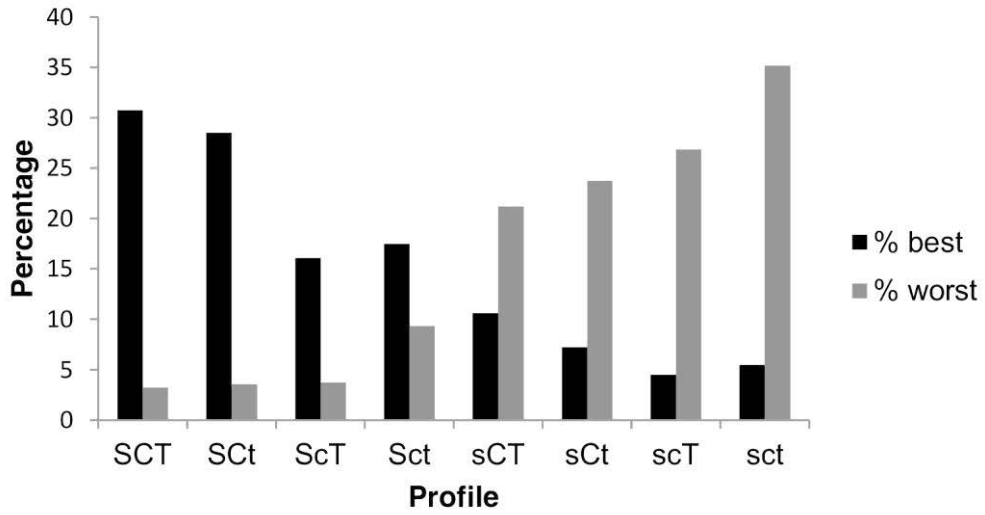

Figure 6: Percentage of people who have best or worst subjective health. Best health = belongs to the highest sextile on the Composite Health Index. Worst health = belongs to the lowest sextile on the Composite Health Index.

4.4 Personality and depressive symptoms (Study IV)

Figure 7 shows the standardized mild depressive symptoms scores in 1997, 2001, and 2007 in the eight character profiles measured in 1997. Bonferroni-corrected comparisons between groups showed that in all three measurement years the four profiles low on Self-directedness (sct, scT, sCt, and sCT) had more frequently mild depressive symptoms than three profiles high in Self-directedness (SCT, SCt, and Sct). The fanatical profile (ScT) was an exception; in all three measurement years fanatical people had more frequently mild depressive symptoms than organized (SCt) people.

Figure 8 shows the standardized mild depressive symptoms scores in 1997, 2001, and 2007 in the eight temperament profiles measured in 1997. Bonferroni-corrected comparison between groups showed that in all three measurement years the four profiles high on Harm Avoidance (nHR, nHr, NHR, and NHr) more often had mild depressive symptoms than the four profiles low on Harm Avoidance (nhr, nhR, Nhr, and NhR). Also, the adventurous profile (Nhr) exhibited more mild depressive symptoms in all three measurement years than the reliable (nhR) profile.

Figure 9 shows the depressive symptoms sum scores in 2007 in the eight character profiles measured in 1997. Bonferroni-corrected comparisons between groups showed

that three profiles high on Self-directedness (SCT, SCt, and Sct) had less frequently depressive symptoms than the three profiles low on Self-directedness (sct, scT, and sCT). Fanatical people (ScT) were again an exception; the fanatical profile did not differ significantly from any other character profile.

Figure 10 shows the depressive symptoms sum scores in 2007 in the eight temperament profiles measured in 1997. Bonferroni-corrected comparison between groups showed that the four profiles high on Harm Avoidance (nHR, nHr, NHR, and NHr) had more frequently depressive symptoms than the three profiles low on Harm Avoidance (nhr, nhR, and NhR). In addition, the sensitive profile (NHR) had more frequently depressive symptoms than the methodical (nHr) profile.

Table 5 shows the frequency of depression (BDI-II) in personality profiles in 2007. "No depression" means that a person's depressive symptoms score is at most 13. "Depressed" means that a person's depressive symptoms score is at least 14. The percentage of depressed people is higher (All %) in all those profiles where Harm Avoidance is high than in those where Harm Avoidance is low. Interestingly, in addition to Harm Avoidance, Reward Dependence and Novelty Seeking seem to contribute to the frequency of depression; sensitive people (NHR) are more frequently depressed (All %) than methodical (nHr), explosive (NHr), or cautious (nHR) people. According to the odds ratios, methodical people (nHr) are not significantly more frequently depressed than reliable (nhR) people. Sensitive people (NHR) have over 5-times higher odds of being depressed, and also explosive (NHr) and cautious (nHR) people have over 3 times greater odds to be depressed than reliable (nhR) people. The number of men in certain profiles is not large but still the difference between the most frequently depressed profile (NHR, 45.5%) and the least frequently depressed profile (nhR, 3.9%) in men is very large in terms of depression frequency. Both in men and women sensitive (NHR) people have the highest frequency of depression. Cautious women (nHR) are rather often depressed (19.8%) but this is not true for cautious men (7.1%).

The character profiles also show differences in depression frequency. Except for the fanatical (ScT) profile, people high on Self-directedness (SCT, SCt, and Sct) belonged less frequently in depressed group than people low on Self-directedness (sct, scT, sCt, and sCT). If Self-directedness and Cooperativeness are held constant (e.g., SCT versus

SCt in Table 3) in all the contrasts the profile higher on Self-transcendence is more frequently depressed (All %). Fanatical men and women (ScT) were more frequently depressed than other profiles high on Self-directedness, and, in men, the fanatical profile was most often depressed (19.0%). According to percentages, disorganized (scT) or depressive (sct) women were more frequently depressed than disorganized or depressive men, respectively. According to the odds ratios, fanatical people (ScT) and those low on Self-directedness (sCT, sCt, scT, and sct) were more often depressed than organized (SCt) people. Disorganized people (scT) were the most frequently depressed group according to the odds ratios.

Table 5: Results of logistic regression where temperament or character profile was the independent variable and binary BDI-II depression score (not depressed = 0 and >13 = 1) the dependent variable

	All %	Women %	Men %	Odds Ratio (All)	CI (All)	p (All)	Odds Ratio (Women)	CI (Women)	p (Women)	Odds Ratio (Men)	CI (Men)	p (Men)
Temperament												
NHR – sensitive	25.9	24.5	45.5	5.78	2.58 - 12.95	< .01	4.74	1.90 - 11.78	< .01	20.01	3.06 - 130.92	< .01
NHr – explosive	17.8	16.9	18.8	3.89	1.63 - 9.31	< .01	3.09	1.06 - 9.04	.04	6.71	1.33 - 33.75	.02
NhR – passionate	6.1	5.8	6.8	1.06	.43 - 2.59	.91	.89	.31 - 2.53	.82	1.60	.27 - 9.28	.60
Nhr – adventurous	6.7	8.1	5.3	1.24	.47 - 3.26	.66	1.31	.40 - 4.24	.66	1.36	.24 - 7.81	.73
nHR – cautious	18.0	19.8	7.1	3.65	1.63 - 8.17	< .01	3.62	1.46 - 9.01	< .01	1.98	.26 - 15.22	.51
nHr – methodical	11.3	12.4	10.2	2.23	.98 - 5.07	.06	2.11	.78 - 5.69	.13	2.54	.54 - 12.04	.24
nhR – reliable	5.6	6.5	3.9	reference			reference			reference		
nhr – independent	6.3	8.1	5.4	1.21	.47 - 3.12	.69	1.29	.37 - 4.43	.69	1.32	.25 - 6.91	.74
Character												
SCT – creative	7.5	8.4	3.9	1.58	.75 - 3.34	.23	1.73	.72 - 4.12	.22	1.00	.17 - 5.70	1.00
SCt – organized	4.5	5.1	3.7	reference			reference			reference		
ScT – fanatical	14.8	12.5	19.0	3.59	1.43 - 8.99	< .01	2.72	.84 - 8.86	.10	6.48	1.44 - 29.16	.02
Sct – autocratic	4.5	5.5	3.8	1.06	.39 - 2.90	.91	1.08	.28 - 4.26	.91	.93	.20 - 4.31	.92
sCT – moody	18.4	18.9	16.0	4.43	2.15 - 9.11	< .01	4.44	1.90 - 10.38	< .01	4.65	1.06 - 20.44	.04
sCt – dependent	14.7	16.4	10.0	3.46	1.45 - 8.25	< .01	3.65	1.33 - 10.05	.01	2.78	.47 - 16.56	.26
scT – disorganized	20.7	23.9	14.3	5.56	2.86 - 10.81	< .01	6.16	2.75 - 13.80	< .01	4.72	1.43 - 15.56	.01
sct – depressive	14.5	17.5	11.6	3.83	1.92 - 7.62	< .01	4.01	1.69 - 9.50	< .01	3.56	1.12 - 11.31	.03

Depression measured by Beck's original Depression Index (BDI-II).
Odds ratio and p-value based on binary logistic regression where depression (0 or 1) was the outcome and personality profile the predictor.
Odds ratios based on the combined sample of men and women
Cohort and sex were controlled in the regression analysis.
Birth year was not controlled when calculating the percentages.

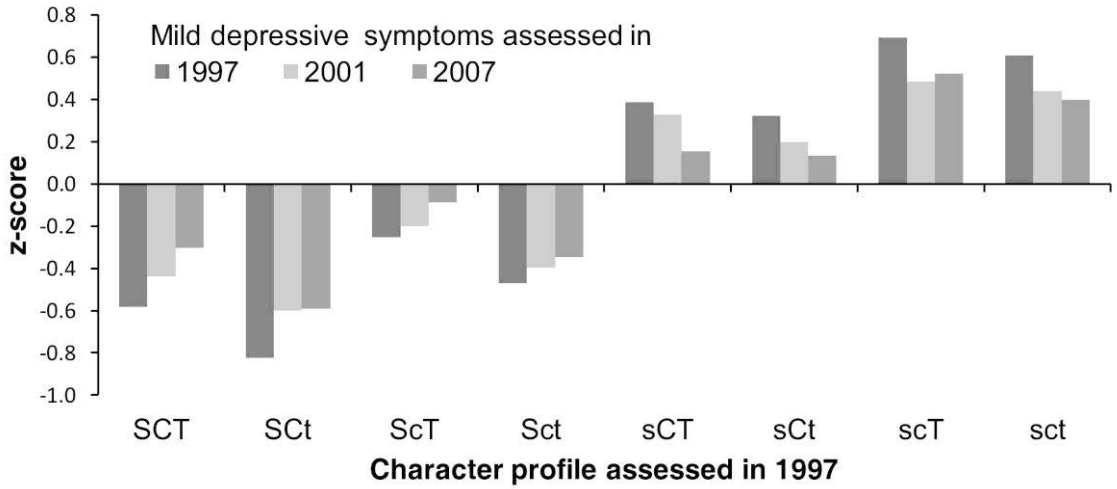

Figure 7: Standardized scores (mean = 0, SD = 1) of mild depressive symptoms (modified BDI) in different character combinations. Sex and birth year were controlled. SCT = creative; SCt = organized; ScT = fanatical; Sct = autocratic; sCT = moody; sCt = dependent; scT = disorganized; sct = depressive.

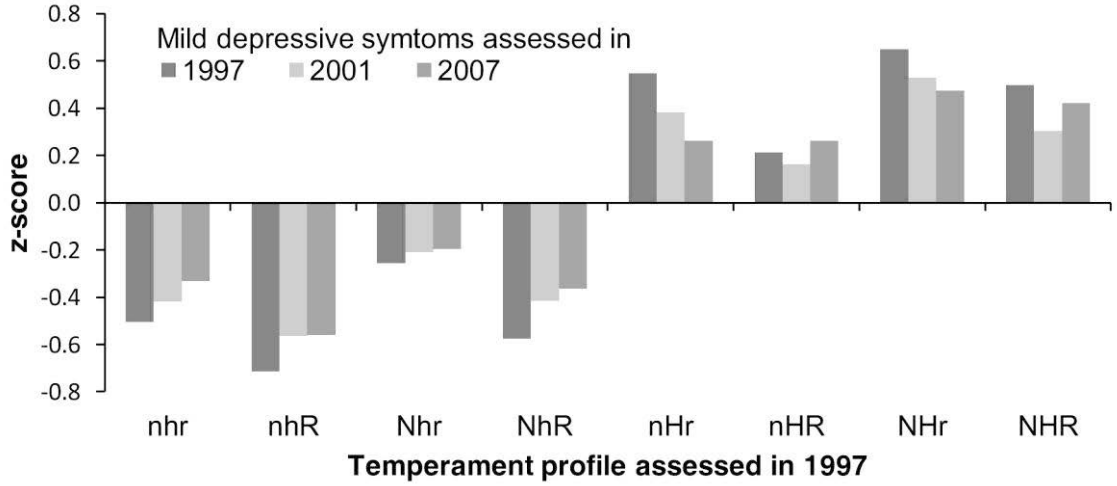

Figure 8: Standardized scores (mean = 0, SD = 1) of mild depressive symptoms (modified BDI) in different temperament combinations. Sex and birth year were controlled. NHR = sensitive; NHr = explosive; NhR = passionate; Nhr = adventurous; nHR = cautious; nHr = methodical; nhR = reliable; nhr = independent.

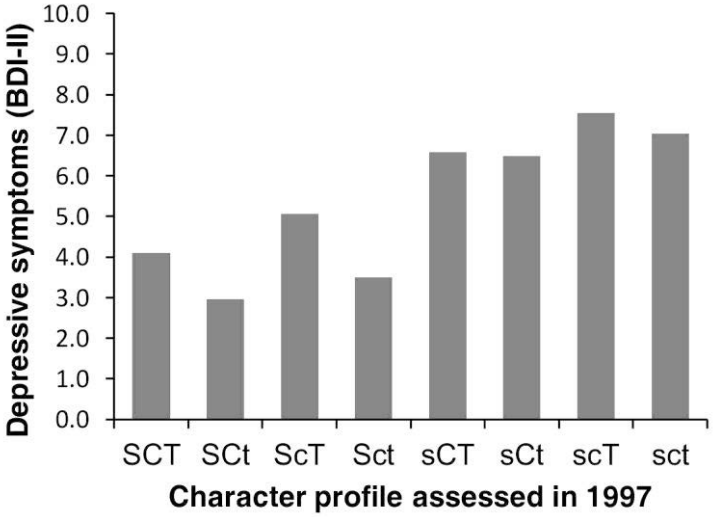

Figure 9: BDI-II depressive symptoms sum scores in different character combinations. Sex and birth year were controlled. SCT = creative; SCt = organized; ScT = fanatical; Sct = autocratic; sCT = moody; sCt = dependent; scT = disorganized; sct = depressive.

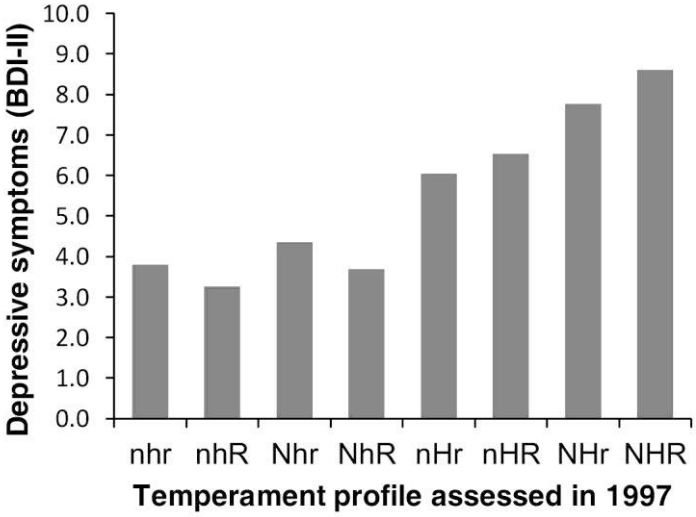

Figure 10: BDI-II depressive symptoms sum scores in different temperament combinations. Sex and birth year were controlled. NHR = sensitive; NHr = explosive; NhR = passionate; Nhr = adventurous; nHR = cautious; nHr = methodical; nhR = reliable; nhr = independent.

5 DISCUSSION

This study examined the development, predictors, and outcomes of adulthood personality. Temperament and character were found to follow different developmental trajectories in adulthood. Character traits changed more over time than the temperament traits. Family environment in childhood and adolescence was more strongly associated with character traits than temperament traits. Accumulation of several risk factors in childhood was a better predictor of adulthood personality than single factors. Character was a strong predictor of well-being. Both temperament and character were strong predictors of ill-being.

5.1 Development of personality in adulthood

The study showed that the rank-order stability of the TCI traits is fairly high and is very similar in magnitude to temperament and character traits. Thus, individuals are likely to retain their relative ranking compared to other individuals over ten years. Mean-level changes revealed that temperament traits measuring basic emotional response biases changed less than character traits. Also, there were no substantial birth-year effects in temperament traits but younger birth cohorts had higher Self-directedness, higher Cooperativeness, and lower Self-transcendence than older birth cohorts. Furthermore, people high on Novelty Seeking, Persistence, or Self-transcendence, or low on Self-directedness or Cooperativeness showed more personality change over time than others. It seems that a mature personality is somewhat less likely to change than an immature personality, but the interplay between all the traits needs to be taken into account to fully understand the dynamics of personality change.

The results suggest that character profiles of Finnish people tend to develop from disorganized (low SD, low CO, high ST) to organized (high SD, high CO, low ST) by the age of 40. Disorganized character can be defined as unconventional behavior and also not setting realistic goals, thinking magically and not analytically, and not having emotionally rewarding and trusting relationships (Cloninger, Bayon, & Svrakic, 1998). Disorganized people are illogical, suspicious, and immature, while organized people are conservative, efficient and consistent. Organized people can reason analytically and are

generally logical, trusting, and mature. Thus, character seems to develop towards greater maturity.

Self-transcendence was the strongest and most consistent predictor of personality change over four years. It has been suggested that Self-transcendence is associated with personal growth and that personal growth facilitates mature personality development (Bauer & McAdams, 2004; Staudinger & Kunzmann, 2005). This mechanism may explain why Self-transcendence predicts personality change.

The results suggest that cultural norms, values, and expectations do not affect temperament traits to the same extent as character traits. It may be that it is culturally acceptable to feel distressed or anxious as long as people can perform their duties and function well in other areas of their lives. According to this view, the emotional responses of people are not seen as positive or negative as long as people can regulate them. Self-regulation is where being a mature person helps.

It has been suggested that there are at least two forces, a socialization effect and a selection effect, that drive the process of personality change (Lodi-Smith & Roberts, 2007; Neyer & Lehnart, 2007). Socialization effects refer to the cultural norms, values, practices, and beliefs that the society tries to exert on individuals. These expectations effect personality by rewarding appropriate behavior and punishing inappropriate behavior (Roberts et al., 2006). As people try to achieve rewards and avoid punishments, people change their behavior to meet the expectations. Selection effects refer to the fact that personality traits "select" people to have certain experiences and then these same traits are also the most influenced in response to those experiences, creating a feedback loop in individuals (Caspi et al., 2005; Jokela, Kivimäki, Elovainio, & Keltikangas-Järvinen, 2009).

In sum, the usefulness of the TCI personality model was shown as a descriptor of personality development within an individual over time. Moreover, the psychobiological theory postulates that differences between temperament-related procedural learning and character-related propositional learning should lead to qualitative differences between the development of temperament and character (Cloninger, 2003; Cloninger, 2004; Cloninger, 2008). Indeed, it was shown that there are qualitative differences between the development of temperament and character. Character and temperament may correlate moderately at one time point but they show

qualitatively distinct developmental patterns. This provides empirical evidence that supports the theoretical distinction between temperament and character.

5.2 Early care-giving and home environment and personality in adulthood

According to the results, temperament and character domains of adult personality are differently related to childhood measures of parental behaviors and family environment. Compared to the four TCI temperament traits, character traits of offspring, Self-directedness and Cooperativeness in particular, were more strongly predicted by measures of parental behavior and childhood environment. This finding is in agreement with our hypothesis suggesting that temperament traits, which are postulated to measure automatic reactions to stimuli, are less malleable by childhood experiences than character traits, which are suggested to measure sociocultural learning and psychological maturity. The difference was observed with both maternal and paternal variables. Furthermore, in agreement with the cumulative stressors model, the number of childhood risk factors was strongly and linearly associated with the character traits of Self-directedness and Cooperativeness. The association between the number of childhood risk factors and the temperament traits of Harm Avoidance and Reward Dependence was weaker and not as clearly linear as for the character traits.

The association between parental care-giving and family environment and the offspring's Self-directedness and Cooperativeness is in line with previous findings, showing that parental acceptance and responsiveness predict positive child development outcomes such as self-regulation, sociability, and self-esteem (Cummings, Braungart-Rieker, & Rocher-Schudlich, 2003), all of which are essential components of a mature personality. Immature character (low Self-directedness and low Cooperativeness) predisposes a person to personality disorders and psychopathology in general (Cloninger, Zohar, & Cloninger, 2010). It is possible that low Cooperativeness and low Self-directedness mediate the associations between risky childhood environments and adulthood mental health outcomes. One's childhood environment is important for development but it interacts with several other factors defining the adulthood personality. This is probably why the parental care-giving and family environment in our study did not explain more than 5% of the variation in any of the personality traits.

Negative events and circumstances in childhood contribute to maladaptive personality, but they are not defining causes; many children with negative experiences grow up to be well-functioning (Cicchetti & Toth, 2005; Paris, 1998). Some childhood adversity effects may depend on later stressors while others might be confined to individuals with pre-existing vulnerabilities (Maughan & McCarthy, 1997). The outcome depends for the most part on the cumulative effect of circumstances and experiences before and after a single negative incident (Sroufe, Coffino, & Carlson, 2010).

In this study study, accumulation of several childhood risk factors was linearly associated with the most immature personality (low Self-directedness and low Cooperativeness), whereas no clear dose-response association was observed for Self-transcendence or any of the temperament traits. The results imply that single measures of parental care-giving and family environment may not be sufficient in measuring the relevant childhood exposures that are relevant for later character development. Rather, the early developmental environment may be best conceptualized as a multidimensional clustering of risk factors that are predictive of personality development in concert with each other.

5.3 Personality in relation to well-being and ill-being

The findings of this study are in agreement with the results obtained by Cloninger and Zohar (Cloninger & Zohar, 2011) in a sample of Israeli people. The results support the hypothesis that character profiles are strongly associated with individual differences in both affective and non-affective aspects of well-being. Furthermore, each character trait makes an independent contribution to well-being depending on the effect of other character traits, that is, trait by trait interactions. In addition, the current results confirmed the findings of previous studies about the strong impact of high Harm Avoidance and low Self-directedness on the frequency of depressive symptoms.

Self-directedness was an important predictor of life satisfaction, social support, subjective health and positive and negative affect. Cooperativeness was associated with social support, happiness, composite health, and positive and negative affect. Self-transcendence was positively associated with increased reports of both positive and negative affect. Correlations among different components of well-being were rather weak, implying that well-being is a concept with multiple dimensions that may vary

substantially in the course of their development. This also implies that well-being cannot be reduced to just one dimension of physical, mental or social well-being. These dimensions must be considered as a whole to gain a comprehensive picture of a person (Cloninger, 2004). The results indicate that all three dimensions of character measured by the TCI influence affective and non-affective well-being by means of their joint interactions.

The use of personality profiles led to an important finding: the effect of Harm Avoidance and Self-directedness on depressive symptoms depends on the configuration of the other temperament and character traits. When more severe depressive symptoms (BDI-II) were assessed, high Novelty Seeking and high Reward Dependence both increased the probability of having depressive symptoms when Harm Avoidance was high. Furthermore, fanatical people (ScT) had an increased risk of having depressive symptoms despite having high Self-directedness.

Another key finding of our study was that the association between temperament and character traits and depressive symptoms might depend on the definition of the depressive symptoms themselves. For example, when mild depressive symptoms were used as a depressive symptoms measure, the effect of Novelty Seeking was quite similar in all personality profiles. However, when BDI-II depressive symptoms were used as a depressive symptoms measure, Novelty Seeking was significantly associated with depressive symptoms only in the profiles with high Harm Avoidance. Furthermore, Reward Dependence was negatively associated with mild depressive symptoms but positively associated with BDI-II depressive symptoms when Harm Avoidance was high. In addition, Cooperativeness was consistently positively associated with mild depressive symptoms but not with BDI-II depressive symptoms.

Temperament and character profiles were associated with depressive symptoms cross-sectionally and also four or ten years later. This is an important finding since it implies that cross-sectional analyses focusing on the association between personality and depressive symptoms give valuable information and predictions can be made using them. TCI profiles identified depressive symptoms both cross-sectionally and prospectively. However, it is not clear what the clinical significance of this finding is. A replication of this study is needed using clinically verified depression as an outcome instead of depressive symptoms.

5.4 Strengths and limitations of the study

The Cardiovascular Risk in Young Finns longitudinal data are a notable strength in this study. The same individuals have been followed for 27 years, which gives unique opportunities for developmental and prospective studies. These longitudinal data are also important from the viewpoint of the psychobiological personality theory, and give an opportunity to deepen the understanding of personality and its development from childhood to adulthood in the light of this theoretical approach. Using multi-level modeling (Study I) made it possible to include all the participants in the developmental study and not just those with full data in every measurement.

This study is based on population-based data which can also be considered a strength. Being population-based increases the external validity of the study. This means, that the results can be generalized with a rather high degree of confidence to other people in the population. Furthermore, when examining the link between the early family environment and adulthood personality (Study II), the same informant did not provide data for both the parental variables and the adulthood personality; the parents assessed themselves, and the children self-rated their own personality 18 years later. This reduces the possibility for recall and common informant biases and increases the reliability of the results.

However, there are also limitations. Most measurements are based on self-reports, which may affect the associations found. In all the studies, women were somewhat overrepresented, which may introduce some bias into the population estimates. When considering the effects of the home environment on adulthood personality or personality development itself (Studies I and II), genetic effects could not be taken into account. This is a limitation because the TCI traits have been shown to be moderately heritable (Gillespie et al., 2003), and, thus, environment and genes together affect the development of personality. It is also possible that the associations we found (Study II) might in part reflect a reverse direction of causality; it might be that the characteristics of the child are causing the observed behavior in the parent (Jokela, 2010). Dropout for various reasons, such as refusal to participate, is always an issue in longitudinal studies. It is likely that the non-participants have a higher level of ill-being and psychopathology than the participants. This is likely to restrict the range of variance in the study variables, thereby lowering the effect sizes of different predictor variables. In the

developmental study (Study I), temperament was measured three times and character only twice. A third measurement would have been useful in clarifying further the developmental trends of the character traits.

5.5 Results in a broad psychosocial context

Well-being and ill-being are part of mental and somatic health. It is well known that genetic factors together with environmental factors contribute to mental and somatic health. Interestingly, there appears to be a social gradient in health (Goldman, 2001). Poverty explains this gradient only partly. Higher social classes (defined by income, education, and occupation) are healthier than lower regardless of poverty and access to health care. It may be that one's relative status in society is more important for health than absolute deprivation (Adler & Newman, 2002). Thus, having less than others could be more important to a person than what a person has in absolute terms. This view emphasizes the importance of the reference group. A poor Finn is much richer than many people in the developing countries, but this Finn compares himself/herself with other Finns and not with people outside of Finland. Relative status could explain why the effects of the social gradient are not restricted to the lower end of the scale. A person may be wealthy compared to an average Finn, but he/she may be poorer than an average person in his/her subjective reference group. Thus, this person may categorize himself/herself as poor if the reference group is rich Finns. Although methodologically demanding, future research should probably use both the relative and the absolute position of a person when studying the social gradient.

The causal chain between social class and health is complex. It includes, among others, the quality of medical care, access to information, health behavior, exposure to bad environment, stressful conditions, access to resources, coping strategies, ability to control one's environment, social support, and allocation of time (Goldman, 2001). It is also possible that social class is a general indicator of one's fitness (broadly defined) which includes aspects of physical and mental health. Thus, achieving a high socioeconomic status in a highly competitive environment may be a marker of one's high vitality.

The observed effects of the social gradient are greatest in middle adulthood (age 45-65) due to the accumulation of different effects over the years and the freedom of making healthy or unhealthy decisions and choices in one's life (Adler & Newman, 2002). Health behavior (e.g., smoking and diet) explains 40% of premature mortality in the USA, and behavior is heavily influenced by personality (Adler, 2009). As the results showed, childhood family factors are important for mature personality development (i.e., healthy personality). A model introduced by Matthews and Gallo (2011) aids in understanding the intraindividual causal chain between different pathways and health. The chain begins with parents' socioeconomic status (SES). In short, low SES predisposes a child to more severe and chronic stressors and offers less resources for buffering the impact of stress (Adler & Ostrove, 1999). Low SES children and adults are exposed to more such situations over the life course that require the use of different coping resources. A stressful environment may prevent the development and replenishment of different psychological coping resources (Matthews & Gallo, 2011). With time, stress may lead to negative emotions and psychological distress. The association between stress and distress is moderated by one's psychosocial resources which include, for example, temperament and character traits, and social support. In threatful environments people are more likely to develop a sense of distrust and fear of others, and are less likely to be able to regulate their emotions. This can be seen as low Cooperativeness, low Self-directedness and chronic hostility (Adler & Ostrove, 1999). Negative emotions and psychological distress may impair one's mental and somatic health through different biobehavioral pathways. For example, a person may drink large amounts of alcohol to alleviate psychological distress. Furthermore, negative emotions may lead to alterations in physiological pathways (e.g., hypothalamic pituitary adrenal axis system responses) which affect health (Matthews & Gallo, 2011).

5.6 What should or could be done? Practical implications of the results

High level of inequality in society is problematic because it causes social tension and political instability (Thorbecke & Charumilind, 2002). This often leads to increased uncertainty which may cause lower economic growth. High level of economic growth is usually linked with a higher average level of well-being and health (Thorbecke &

Charumilind, 2002). Although high socioeconomic status is linked with high level of well-being and health, the answer is not to even out all differences in SES. This would mean that all people have an equally high level of income, education, and occupational status which would probably lead to motivational and other problems due to increased competition in many niches of life. Furthermore, division of labor and specialization would probably be more difficult to achieve in a totally homogenous population. High division of labor is usually associated with higher average wealth in many nations (Rodriguez-Clare, 1996). Some level of inequality is probably acceptable and even desirable in well-functioning society. However, inequalities should not be too large although defining the threshold between acceptable and too large is far from easy.

Health inequalities describe the differences in health between individuals and groups but do not consider the fairness or unfairness of these differences. Health inequity takes a moral ground and describes those inequalities in health that are unfair or unjust (Kawachi, Subramanian, & Almeida-Filho, 2002). The question is how to define the fairness or unfairness of observed differences in health which well-being and ill-being are part of. The question has no clear objective answer. The answer depends on how one defines justice, how one defines the role of society, and what one considers the source of health inequalities (Kawachi et al., 2002). Much of the debate on the subject revolves around the concept of free will and the role of individual responsibility. On one hand, most health inequalities can be seen as the result of making choices (e.g, smoking, unhealthy diet, lack of physical exercise, lack of motivation). Disadvantaged groups can be seen to be responsible for their greater health risk because they could behave differently and make healthier choices (Adler, 2009). On the other hand, many choices can be seen to arise from external circumstances (e.g., peer pressure, effect of advertising). Claims have been made that focusing on the characteristics of individuals deflects attention from unjust social conditions and the institutional processes that create them (Adler, 2009). In extreme positions, these two views (making choices versus external circumstances) may lead to blaming the victims of all their suffering or to completely denying the existence of free will. The most plausible position lies between these two extreme views. Research has shown that at least some social determinism exists in health inequalities (Kawachi et al., 2002). First of all, one cannot choose one's genes. Second, childhood and early life course influence adult health even when

children cannot make their own choices. It is also clear that one's chances in life depend, at least partly, on contextual factors. It is not easy to become a professional without the proper tools, and healthy development is challenged in a constantly stressful environment. In contrast, research on resiliency reveals the power of individuality in child development. Many children exhibit no symptoms of abnormal development even under conditions of extreme conditions such as child abuse (Cicchetti, 2010).

What are the effective ways to lower health inequalities? This is an important but extremely difficult question. Society evolves and changes constantly. It is challenging to reliably isolate the effect of a single factor on health (Lee, 1999). Furthermore, globalization and open world trade tend to increase inequality because rich people gain prosperity and poor do not (Nayyar, 2006). The easiest and fastest tools of a government are taxation and income transfers (Tarlov, 1999). But how much can the wealthiest be taxed without upsetting them? When is a tax rate too high? Do income transfers make the less well-off more passive by requiring too little and by giving too much? These are important questions that have no simple answers. Some think that tax rate should be 0%. Some think that tax rate should be near 100% for the wealthiest. Fitting all opinions together is no easy task. Tax payers' money can be used to implement different intervention programs to reduce health inequalities. However, funding should not be granted to every program that sounds good on paper. Possible intervention programs need to fill several requirements before they can be recommended with a high degree of confidence (Adler & Newman, 2002). First, they need to show plausible causal pathways between the intervention and reduced health inequalities. Second, interventions should be able to quantify how much change in inequalities is required to affect health. Third, realistic social and economic benefits of the intervention should be presented.

There is an agreement that health interventions early in life are important because experiences early in life set individuals on different trajectories and teach people unhealthy habits that are usually highly resistant to change later in life (Adler, 2009). Special emphasis should probably be put on those less well-off. Highest priority should be given to women of child-bearing age, expectant mothers, and children (Lee, 1999). It is most convenient to implement the interventions in cooperation with those officials and experts that work with children and mothers. In this light, some of the best places

for interventions are child welfare clinics, preschools and schools. A successful intervention needs to account both individual and environmental factors. A reasonable minimum goal could be to provide everyone access to the resources (e.g., basic sports facilities) needed to engage in health-promoting behaviors. This goal can be called the social justice principle (Adler, 2009).

Access to resources is necessary but not sufficient to maintain healthy behavior. Behavior is strongly associated with individual characteristics (e.g., personality). Character traits, especially Self-directedness and Cooperativeness, are associated with living a healthy life. High Self-directedness helps in setting realistic goals and reaching them. High Cooperativeness helps in getting along with others and maintaining healthy relationships. Fortunately, it is possible to exercise, develop, and increase the level of one's character traits through interventions (Cloninger, 2006). Self-directedness can be increased by encouraging a sense of hope and mastery. Cooperativeness can be increased by encouraging one to be kind and forgiving. It is important to be non-judgmental and sensitive when considering who a person is, and who he/she should or could be. Blaming attitude will not help one to develop one's character. To be able to change, people must face who they are and recognize both the advantages and disadvantages of their current way of living (Cloninger et al., 2010). This may temporarily lead to a decrease in mental well-being until people change, often in a short moment of insight, and increase in well-being.

5.7 Conclusions and guidelines for future research

This study took personality into its focus and explored which factors predict personality development, how personality develops in adulthood, and what are the outcomes of different kinds of personalities. The study led to several important findings. Temperament and character follow different kinds of developmental trends in adulthood. Character changes more with time than temperament. Furthermore, character development showed strong cohort effects while temperament development did not. This suggests that temperament and character are qualitatively different, which gives support for separating them theoretically. The findings suggest that normative adulthood development in Finland includes a strong increase in Self-directedness and Cooperativeness and a decrease in Self-transcendence. As Self-directedness and

Cooperativeness are strongly associated with well-being and psychological maturity, a serious concern should be raised concerning the well-being of those people who show a decrease in Self-directedness or Cooperativeness with time. Possible increasing Harm Avoidance is also alarming, since normative development includes a highly stable level of Harm Avoidance, and high Harm Avoidance is strongly associated with different kinds of psychopathology. The results also imply that character is more susceptible to environmental influences than temperament. This can be seen as strong cohort effects in character development. This means that possible interventions aimed at increasing well-being should probably target character instead of temperament. Interventions should probably not focus on the quality or intensity of emotions (temperament) but on living a balanced life with awareness and understanding of one's emotions (character).

This study also found a strong link between the childhood family environment and the level of character traits in adulthood. Temperament was not affected as much as character. Single environmental variables had only small effects, and the cumulative effect of several environmental variables was a much stronger predictor of personality in adulthood. It is possible that immature personality development explains why a badly functioning childhood home environment leads to a high risk for adulthood psychopathology. This suggests that especially character development should be the target for possible interventions. However, the results support the finding that focusing on only one childhood adversity factor among individuals exposed to many will not have strong positive effects (Kessler et al., 2010). A successful intervention should target all dysfunctional aspects of a child's life at the same time since they all interact (Cicchetti, 2004). It is not easy to achieve this goal, however, since every family has a unique set of problems, and resolving these requires a lot of careful planning, expertise, time, money, and cooperation between many officials.

This study also showed the usefulness of personality profiles in understanding well-being and ill-being within individuals. It was found that all three character traits have an independent effect on well-being regardless of the configuration of the other character traits. All three character traits must be taken into account in clinical work when considering the link between individual characteristics and well-being. An important message is that psychological well-being seems to be, to a large extent, a within-person characteristic. This means that interventions focusing only on environmental factors will

probably have a limited effect on well-being. It should be acknowledged that well-being is a combination of individual and environmental factors and that both are needed to fully understand well-being.

Interesting interactions were found in regard to personality and depressive symptoms. If Harm Avoidance is high, high Novelty Seeking and high Reward Dependence together seem to increase depressive symptoms. So it is not HA alone but HA together with RD and NS that explains the association between temperament and depressive symptoms. Furthermore, fanatic people with high SD, high ST, and low CO were shown to be vulnerable to depressive symptoms despite having high SD. This is an interesting finding and should be a topic for future research. These findings show that focusing just on the main effects of single traits may hide important interactions between different traits. These interactions must be studied to capture the full complex dynamics between personality and depressive symptoms.

The present study offers several suggestions for future research. The normative developmental trajectories are now known but it would be interesting to study people whose personality develops contrary to the normative expectations and find explanations for these deviations. Regarding the link between childhood environment and adulthood personality, the role of the parents' own personality should be studied. It would be interesting to know if the cumulative effects of the early family environment on the offspring's personality are significant even after controlling for the parent's personality. The research concerning well-being and ill-being would benefit greatly if the complex dynamics between temperament and character traits could be understood. This requires studying the interactions between temperament and character.

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